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Telephony.

VOLUME VIII.
NUMBER 5.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

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CHICAGO, NOVEMBER, 1904.

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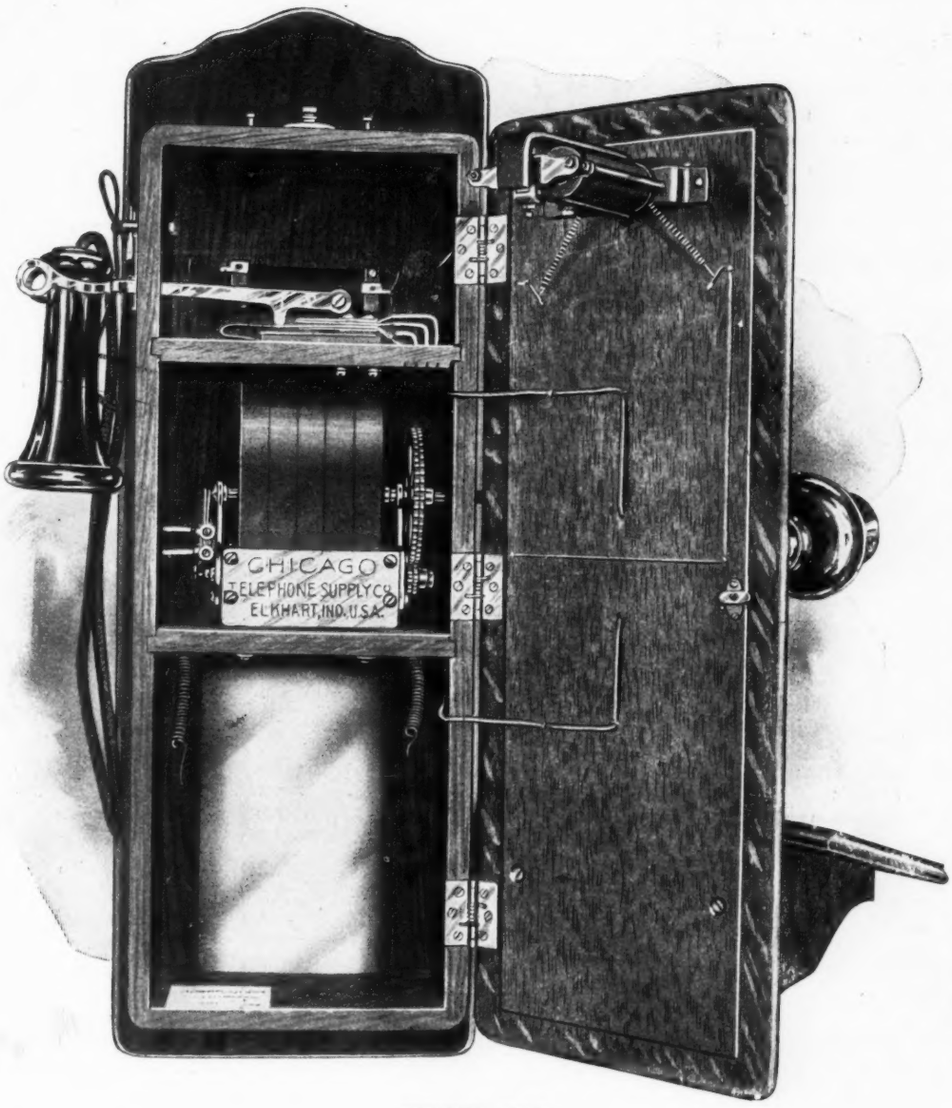
Get Good Out of Your Telephones
By Getting Telephones with Good in Them



Taking down of receivers along the line does not weaken the ringing circuit.

Get all the particulars and you will find life easier.

Poor service on bridging lines is often caused by curious subscribers who take down their receivers.

Such action will not interfere with the service if this telephone is used.

MODEL 345

Have you a copy of our new catalogue illustrating 1905 models?

May we send you one?

Chicago Telephone Supply Co.

THE GREAT MAIL ORDER FACTORY

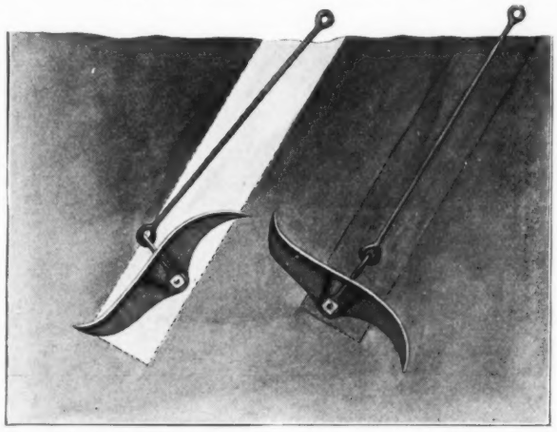
NEW YORK **ELKHART, INDIANA.** SAN FRANCISCO

CHICAGO TELEPHONES SATISFY

Please tell the Advertiser you saw his Announcement in TELEPHONY.

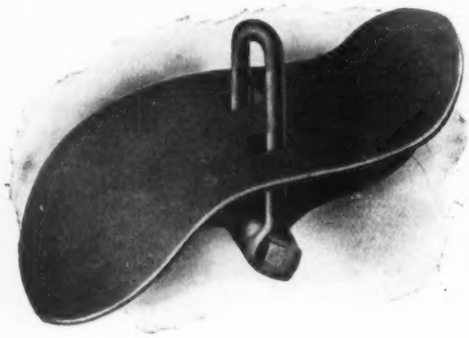
21 Cents worth of this Anchor holds 8,713 pounds, 42 Cents worth holds 10,521 pounds—more than twice the strain resistance of any other method.

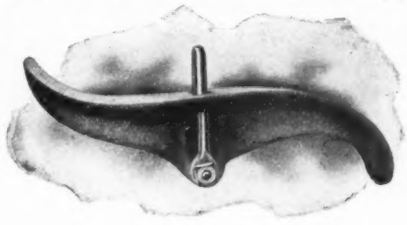
The American Bull-Tongue Anchor



is the scientific and practical method of anchoring poles. Made of cast-iron, heavy, designed to be easily placed into the ground and hold when so placed by the direct strain upon the solid or undisturbed earth. Made without rod—takes any rod—and prices based accordingly.

Method of installation is simple, requiring less effort and time than any other method. Small hole required. Anchor so designed as to place entire strain upon undisturbed earth. Once placed requires no take up in strand, no slipping, no allowance necessary for settling of loose earth. Anchor adjusts itself readily at right angles. Gives over double the strain resistance of any other method without faults of any. Low in price. Last forever, no one part weaker than the whole. Unaffected by rust. Once burried will not give a single inch under maximum strain. Simply dig a hole the small size of anchor, drop in anchor, fill up hole, apply sufficient strain to tighten guy and anchor bear directly upon solid earth. Depth of hole may be varied with corresponding increase of strain. Anchors will hold anything rods or guy will hold.





The "Bull Tongue Pull"

Is about double that of any similar device; it is easier to use and keep on using; costs less to put under ground and service is double; low in cost

TRADE NO.	SIZE OF ANCHOR	SIZE HOLE REQUIRED	STRAIN RESISTANCE BURIED 4 FEET	PRICE EACH	CODE WORD
2500	3 x 8 inches	3 inches	8,712 "	**$0.35**	Ezeankor
2501	4 x 10 "	4 "	10,521 "	**.70**	Ezebury
2502	5 x 12 "	5 "	15,412 "	**1.20**	Ezeprice
2503	6 x 15 "	6 "	16,645 "	**2.50**	Ezelabor
2504	7 x 17 "	7 "	19,380 "	**4.60**	Ezeinstal
2505	8 x 18 "	8 "	21,600 "	**8.00**	Ezehole
2506	10 x 22 "	10 "	33,537 "	**13.50**	Ezedig
2507	12 x 25 "	12 "	45,210 "	**20.00**	Ezer

GENTLEMEN:—The writer, this day, witnessed the testing of the holding power of **a 12-inch American Anchor installed five feet** in the ground near the Campus of our College, a **strain of 60,000 pounds being applied without moving the anchor an inch.** The strain was then increased until the connecting rod broke, the anchor remaining unmoved. We were thus unable to determine how great a power would be required to pull up the anchor. This test was made in the presence of several witnesses immediately after the anchor was installed.

REV. CARL ACKERMANN,
Prof. Mathematics, Lima College.

GENTLEMEN:—We have tried the Anchor made by your company on our pole lines, and have subjected some of them to a very hard strain, and our experience with this Anchor leads us to believe that it is the best on the market, and we have adopted it as our standard in new and all reconstruction work that we may have to do.

Yours truly,
THE LIMA ELECTRIC RY. & LIGHT CO.,
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The greatest service, the most enduring, most practical, labor saving Anchor at a popular price.

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I. A. BENNETT, Manufacturer, Monadnock Block, CHICAGO

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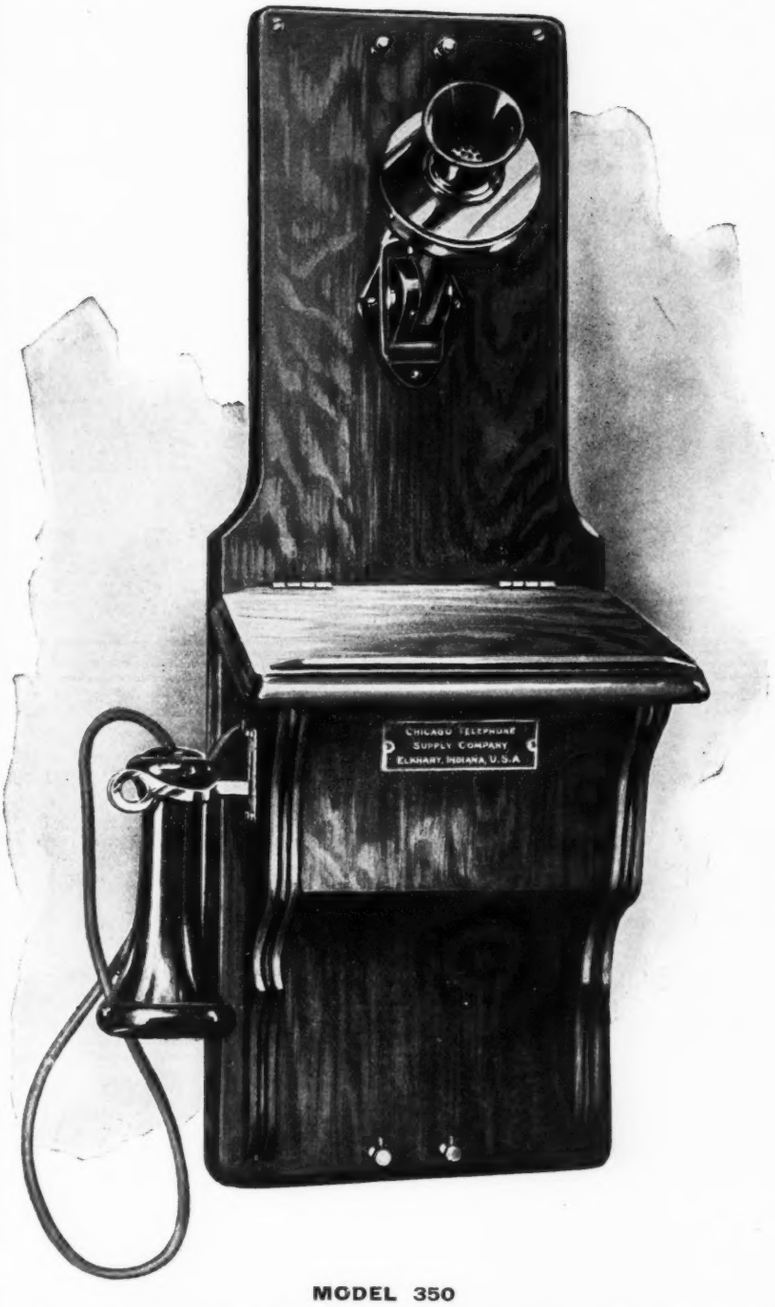
Ornament Your Exchange



MODEL 350

A telephone for the booths at your central office.

A handsome instrument with no superfluous parts.
Reasonable prices.

Why use regular exchange telephones in your booths at the exchange, when no ringing circuit is needed?

Let us send you a sample to be returned if it is not satisfactory in quality and price.

Have you a copy of our new catalogue, illustrating 1905 models?
May we send you one?

Chicago Telephone Supply Co.

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NEW YORK ELKHART, INDIANA. SAN FRANCISCO

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WE MANUFACTURE
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CABLES

We Fully Guarantee Our Products.

Write us for prices.

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"HEMINGRAY"
ALL WITH THE "PATENT DRIP PETTICOATS."

THE HEMINGRAY-GLASS CO.
Office, Covington, Ky. Factory, Muncie, Ind.
ESTABLISHED 1848

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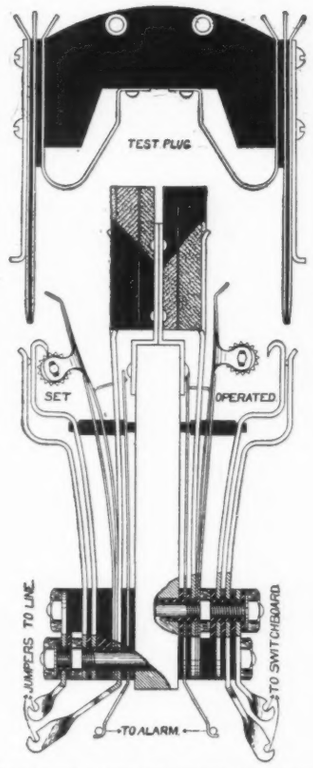
COOK'S No. 444

THE ONLY PROTECTOR WITH A REAL SELF-SOLDERING, SELF-RESTORING, SELF-CONTAINED HEAT COIL :: ::

COOK'S No. 444

THE ONLY SIMPLE, EFFICIENT AND INVARIABLY RELIABLE PROTECTOR

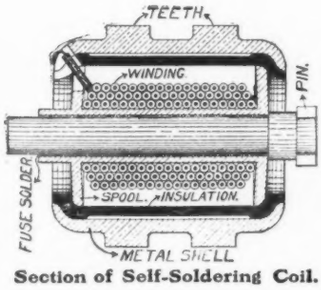
COOK'S No. 444



Sectional view showing Test Plug

THE ONLY ONE MANUFACTURED BY THE INVENTOR UNDER HIS OWN BROAD PATENTS AND GUARANTEED ABSOLUTELY NON-INFRINGING

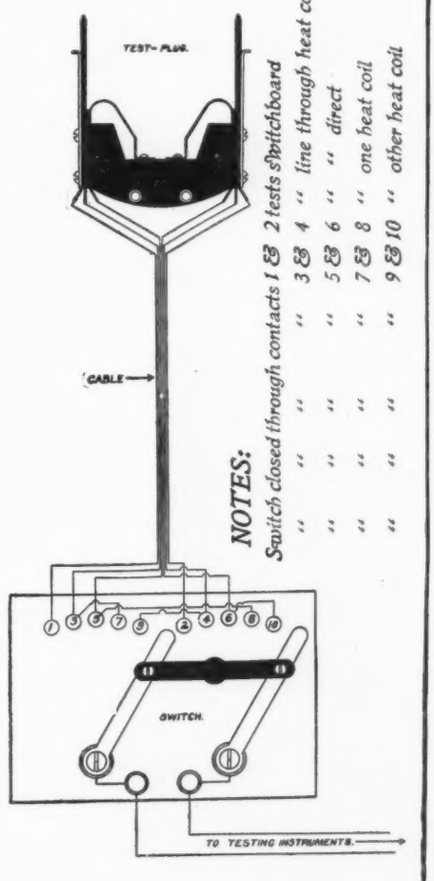
THE ONLY PROTECTOR so arranged that all circuits may be tested by one insertion of a test plug without removing the heat coils or lightning arresters.



Section of Self-Soldering Coil.

THE ONLY PROTECTOR in which the circuit controlling spring can be reset in one operation, without touching the heat coil or disturbing its position. It doesn't have to be reversed.

TEST-PLUG AND TESTING CIRCUITS FOR #44 AND #444 PROTECTORS.
FRANK B. COOK, CHICAGO ILL.



NOTES:
Switch closed through contacts 1 & 2 tests Switchboard
" " " 3 & 4 " line through heat coils
" " " 5 & 6 " " direct
" " " 7 & 8 " one heat coil
" " " 9 & 10 " other heat coil

Frank B. Cook. INVENTOR AND MANUFACTURER
242 W. LAKE STREET, CHICAGO

Silk Cords

Write for New Prices

"THERE IS BUT ONE SUCCESSFUL STEEL CORD AND WE MAKE IT"

P. B.
B. R.

Switchboard Cords

Samples on Application

THE McDERMID MFG. COMPANY

118 W. JACKSON BOULEVARD, CHICAGO

The WARNER SWITCHBOARD { POWER GENERATOR

DRY BATTERY OUTFIT COMPLETE.

SAVES { TIME. MONEY. NERVES.

RESULTS { BETTER SERVICE. SATISFIED CUSTOMERS. INCREASED BUSINESS.

COST FOR BATTERY RENEWALS LESS THAN 25c A MONTH PER 100 SUBSCRIBERS. . . . .

ONE OPERATOR { CAN ANSWER MORE CALLS USING OUR GENERATOR THAN TWO OPERATORS CAN USING HAND GENERATORS. . . .

LISTEN { NO BELTS TO BREAK. NO BEARINGS TO OIL. NO POWER BILLS TO PAY. NO MORE GENERATORS TO BUY.

Entirely Automatic. Requires Absolutely No Attention.

GUARANTEED TO DO ALL YOUR RINGING UNDER ANY AND ALL CONDITIONS.

We are furnishing this Generator for selective signaling, producing pulsating current, on all orders now.

CAN RING THROUGH 500,000 OHMS, IF NECESSARY.

Write Us. We will tell you all about it. Get our latest catalogue.

THERE IS NO LIMIT TO OUR GENERATOR.

MANUFACTURED EXCLUSIVELY BY THE

WARNER ELECTRIC CO., MUNCIE, IND.

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Morris Hard Fibre Cleats

MADE ESPECIALLY FOR TELEPHONE INSTALLATIONS

Just what you have been looking for

STYLE "A"

Made with Single Groove for Twin or Parallel Wires.

DIMENSIONS
¾-in. long 13/32-in. wide
¼-in. thick ¼x⅛-in. groove
PRICE, $4.30 PER 1000

STYLE "C"

This is our Baby or CORNER CLEAT, the smallest, strongest and neatest Cleat on the market, and "comes in handy" everywhere. Have you used them? If not, ask us for samples at once.

DIMENSIONS
1 1/16-in. long 13/32-in. wide
¼-in. thick ¼x⅛-in. groove
PRICE, $4.00 PER 1000

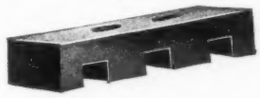
STYLE "B"

Made with two Grooves and especially adapted for Twisted Pair Telephone Wires. Only one screw necessary to hold Cleat firmly in position.

DIMENSIONS
¾-in. long 13/32-in. wide
¼-in. thick ⅛x⅛-in. groove
PRICE, $4.50 PER 1000

STYLE "D"

Made for three wires and takes up very little room. If installed with brass or nickel screws, makes a very pleasing appearance.



DIMENSIONS
1⅛-in. long 13/32-in. wide
¼-in. thick ⅛x⅛-in. groove
PRICE, $6.50 PER 1000

THE MORRIS HARD FIBRE CLEATS

are neat, durable, easy to install, good insulators, and on account of the finished appearance they make, are just the thing for office or residence installation. They are gradually taking the place of the clumsy wood and porcelain cleats. In ordering, be sure and mention which color you prefer—**Red, Gray, Black**—otherwise we will send red.

MORRIS ELECTRIC CO., Inc.

WILMINGTON, DELAWARE

Manufacturers of Fibre and Fibre Specialties

OUR CLEATS CARRIED IN STOCK AT THE FOLLOWING AGENCIES:

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Northern Electric Co., Duluth, Minn.
M. B. Austin & Co., Chicago.
Florida Electric Co., Jacksonville, Fla.
American Electric Co., St. Paul, Minn.
Julius Andrae & Sons Co., Milwaukee, Wis.
Varney Electrical Supply Co., Indianapolis, Ind.
Electrical Equipment & Supply Co., Pittsburg, Pa.
Doubleday-Hill Electric Company, Pittsburg, Pa.
Farr Telephone & Construction Supply Co., Chicago, Ill.
Creaghead Eng. Co., Cincinnati, O.
Southwestern Electrical Engineering & Construction Co., Dallas, Texas.
Western Electric Co., Philadelphia, New York, Chicago, Denver and Omaha.
Novelty Electric Co., Philadelphia, Pa.
Standard Electric Co., Norfolk, Va.
E. G. Bernard Co., Troy, N. Y.

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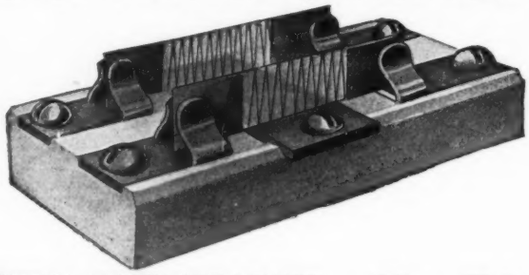
CENTRAL PROTECTORS

CENTRAL PATENT-WRAPPED FUSE
Used in all CENTRAL PROTECTORS.

Mention This Ad and Send Request to



Single or Double Line Fuse Block SAMPLE FREE

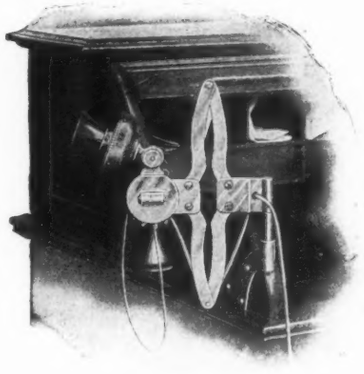
CENTRAL TELEPHONE & ELECTRIC CO.

2133 to 2137 Lucas Ave., St. Louis.

OR

DEARBORN ELECTRIC CO., Chicago, Ill. **POST-GLOVER ELECTRIC CO., Cincinnatti, O.**
W. G. NAGEL ELECTRIC CO., Toledo, Ohio. **DUNCAN-HOBSON ELEC. CO., Dallas, Texas.**

The Adjustaphone



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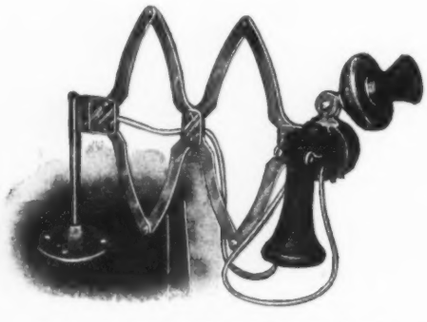
An invaluable adjunct to the busy man's desk. *Saves time, temper* and *trouble* — one of those simple, right-hand devices that your subscribers appreciate at sight. All the faults of the old, breakable desk set have been eliminated in the **Adjustaphone.** Made for any Transmitter, Receiver or System, and for any style of desk.



No. 6. Double Length for Flat Top Desk

Mechanical perfection, durability and efficiency fully guaranteed. *The best promoter of extended service and more business that a telephone company can use.* Prices and full particulars on request.

Address Telephone Department

Chicago Writing Machine Co.
MANUFACTURERS
211 Wendell Street **CHICAGO**

CENTURY
100% GOOD

If you are contemplating the purchase of new Telephone Equipment for either common or local battery service, a thorough investigation of CENTURY Apparatus would be advisable.

First: Because it is as nearly perfect electrically and mechanically as it possibly can be.

Second: The manufacturers of Century Apparatus have an extended, practical experience in the construction and operation of exchanges, making it possible to develop the apparatus along practical lines.

Third: The efficiency and reliability of the apparatus have been proven in their own exchanges before being placed on the market.

Century Telephone Construction Co.

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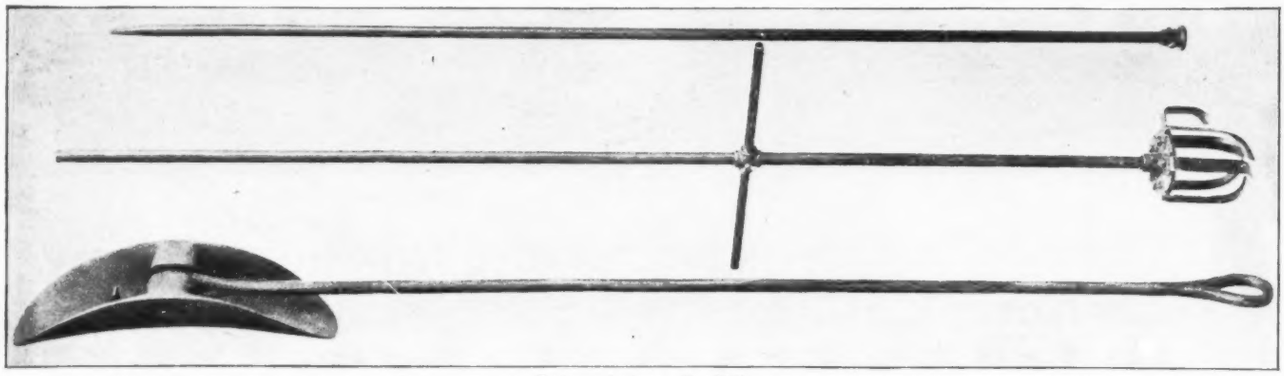
528-540 ELLICOTT SQ.

FACTORY & WAREHOUSE
481-489 WASHINGTON ST.

BUFFALO, N.Y.

"THEY NEVER PULL UP"

THE MILLER ANCHOR FOR HEAVY CABLE WORK



Patented Aug. 25, 1903.

Our Anchors can be set in from thirty to forty minutes, eight feet deep, and they will stand a strain of 40 to 50 tons.

PRICES OF ANCHORS

No. 6, 10x25 in., 1¼ in. rod, 9 ft. long, **$6** No. 7, 10x30 in., 1⅜ in. rod, 9 ft. long, **$8** No. 7, 10x30 in., 1½ in. rod, 9 ft. long, **$10**

AUGERS FOR SETTING ANCHORS

This Auger has a 9 foot stem, one inch in diameter, with an adjustable handle. As the Auger goes down the handle can be moved up the stem. Bores a 12-inch hole, the right size for all of our Anchors. Price of Auger, **$5.00.**

MILLER ANCHOR CO., Norwalk, O.

Acme Electric & Telephone Co.

HAS REMOVED TO ITS

New Factory Building

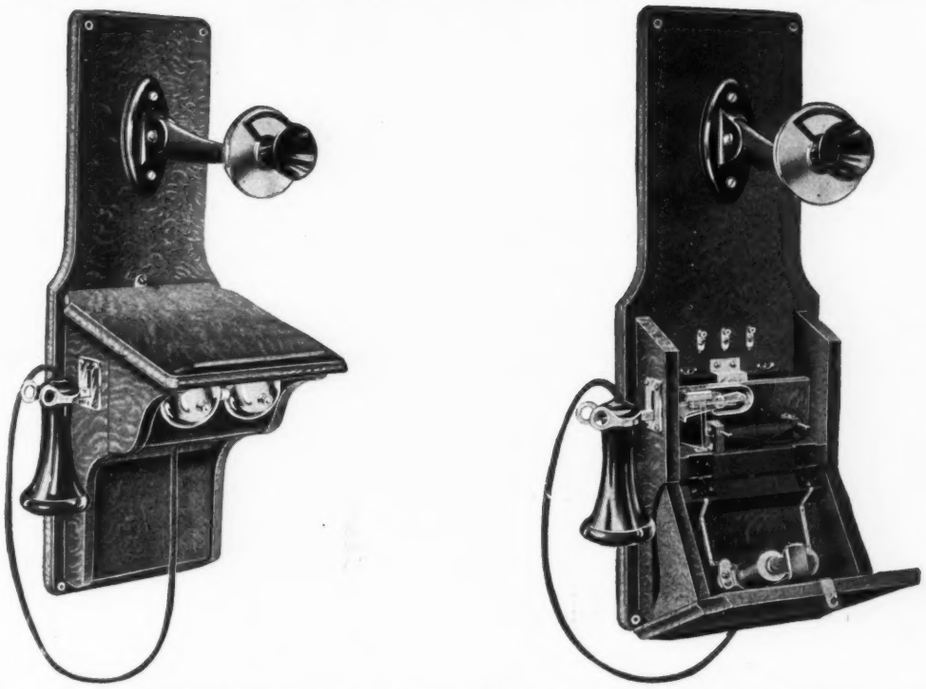
—AT—

69-71-73-75 West Jackson Boulevard Chicago

New machinery, larger quarters, better facilities will enable us to keep up with the greatly increasing demand for Acme Apparatus. No delays now. We can fill all orders promptly.

Correspondence Invited

DEAN
TELEPHONE APPARATUS



THIS COMMON BATTERY WALL SET IS provided with the Dean long distance transmitter and receiver and is wired with the most efficient talking circuit ever devised. It has many other new features.
THE MOST EFFICIENT PHONE MADE.

OUR LOCAL BATTERY (MAGNETO) SETS ARE OF THE SAME HIGH GRADE.

SEND TO-DAY FOR SAMPLE ORDER.

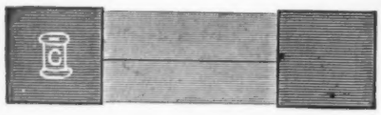
THE DEAN ELECTRIC COMPANY
ELYRIA, OHIO

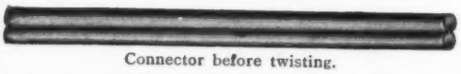
Please tell the Advertiser you saw his Announcement in TELEPHONY.

LEST YOU FORGET

We carry a complete Line of TELEPHONE SUPPLIES

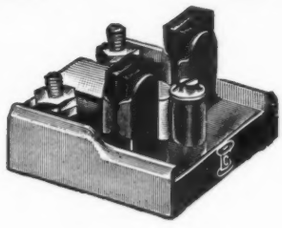
"Veribest" Glass Fuse.
Patent Pending.

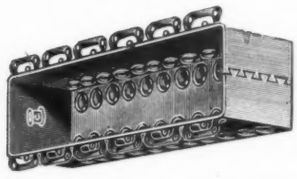




Connector before twisting.

Connector after twisting.





Standard for Accuracy

Chicago Fuse Wire & Mfg. Co.

CHICAGO 358 Dearborn Street

NEW YORK 853 Broadway

BUFFALO Mutual Life Building

Telephone and Telegraph Wire

Made by continuous process from the best Rods obtainable. Possesses great Strength and high conductivity. Pliable, yet tough and uniform.

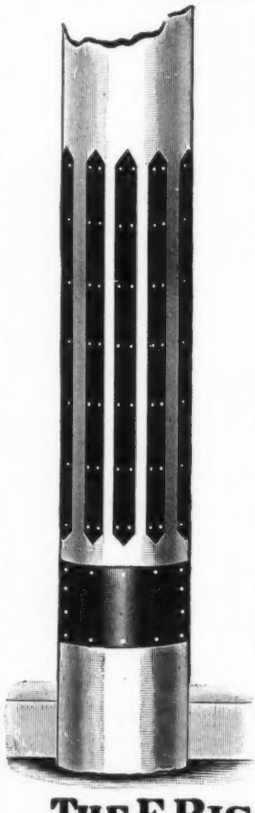
GUARANTEED STANDARD

Our Wire is known to the trade as, "Extra BB," "BB" and "Steel."

Your orders are earnestly solicited. Write for our quotations and Special Discounts.

Indiana Steel & Wire Co.

MUNCIE, INDIANA.



Our Galvanized Pole Strips

are concaved to conform approximately with shape of pole. Size 2 inches wide by 4 feet long, 22 guage.

Hub or Butt Plates

Galvanized,—rolled to a diameter of 14 inches. Punched for 20-penny wire nails. Size 15x18x3-16 inches, weight 15 pounds. Size 18x20x3-16 inches, weight 20 pounds.

LOWEST PRICES QUOTED ON APPLICATION

THE F. BISSELL COMPANY

Telephone Supplies. **TOLEDO, O.**

Please tell the Advertiser you saw his Announcement in TELEPHONY.

"There, that's for being good."

J. GEO. SCHWEIZER, PRESIDENT. CHAS. H. SCHWEIZER, SECY AND TREAS. W. D. BURFORD, SUPERINTENDENT.

LA CROSSE INTER-URBAN TELEPHONE COMPANY

LA CROSSE, WIS.,

Vought-Berger Co.,

City.

Gentlemen:-

We acknowledge receipt of switchboard and one hundred bridging telephones delivered to us within ten days, pursuant to contract.

We are highly pleased with the manner in which you met all the conditions of your contract. Although the time given within which to make a delivery was very short the contract was not only filled promptly on time, but somewhat in advance of requirements. The equipment is first-class and satisfactory in every respect. Our superintendent, Mr. W. D. Burford, advises us that everything was found in perfect order and not a single telephone out of the entire one hundred required any change in adjustment, something unusual in his experience.

Check in payment will go to you on the 10th inst. as agreed.

Yours very truly,

La Crosse Inter-Urban Telephone Co.

By Chas H. Schweizer.

Secretary.

THE VOUGHT-BERGER COMPANY

Makers of First-Award TELEPHONES, SWITCHBOARDS AND APPLIANCES

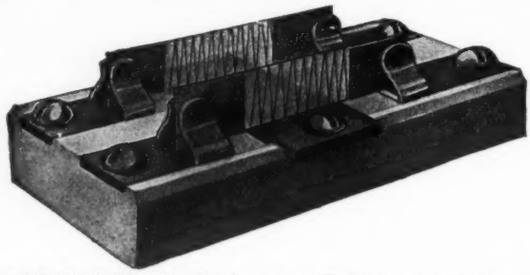
LA CROSSE, WISCONSIN

Please tell the Advertiser you saw his Announcement in TELEPHONY.

OUR PROTECTORS PROTECT

TERMINAL HEADS
DISTRIBUTING BOARDS
CROSS CONNECTING BOARDS } With Patent Fuses

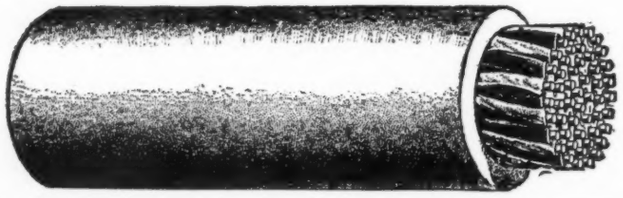
Construction Material. Large and Varied Stock. Prompt Shipment.



Telephone Instruments and Switch Boards

SAMPLE FREE. Any Exchange or Toll Line requesting sample fuse block may have one single or double line block mailed ABSOLUTELY FREE.

COMMERCIAL ELECTRICAL SUPPLY CO.,
1007-1009 Market St., ST. LOUIS, U. S. A.



It Pays to Test

Your lines periodically for insulation and resistance.

This can be best done with a Volt Ammeter. Mine are especially designed for telephone men. Their price is low too.

Write me and I'll tell you more about my goods.

Louis M. Pignolet

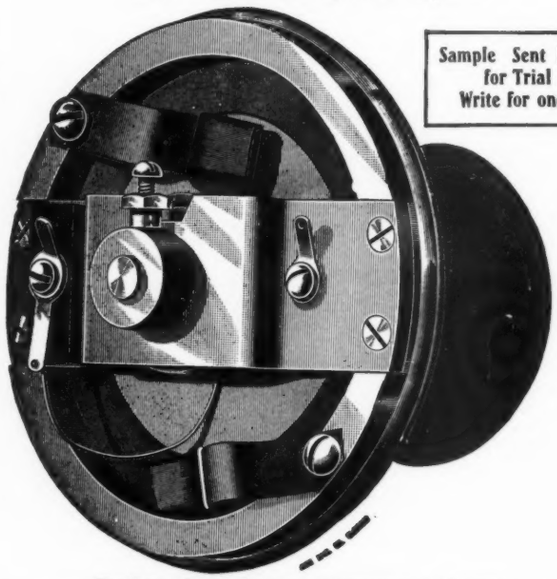
82 Cortlandt St., N. Y.

ADOPTED BY

U. S. WAR DEPARTMENT

After careful test by their experts.

Sample Sent Free for Trial
Write for one.



Perfect Articulation, Clearness, Volume.

The Williams-Abbott Electric Co.

8, 10, 12 Columbus St., Cleveland, Ohio.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

The "LORIMER"

The SYSTEM of the FUTURE

FULL AUTOMATIC and CENTRAL ENERGY

Patents Granted

Great Britain	New Zealand
France	South Australia
Belgium	New So. Wales
Italy	Queensland
Spain	United States
Sweden	Denmark
India	Austria
Cape of Good Hope	Hungary
Mexico	Canada
Victoria	

Patents Pending

Germany	Japan
Norway	United States (5)
Russia	

THE AMERICAN MACHINE TELEPHONE CO., LT'D

Piqua, Ohio, and Brantford, Canada

THE CANADIAN MACHINE TELEPHONE CO., LT'D

Toronto Canada

The Rentability of Your Line

and the life of your linemen depend on the life of your poles, crossarms, brackets and pins.

Rain and Snowstorms Lose Their Terror

where poles and crossarms were made water and rot-proof by treatment with

S. P. F. CARBOLINEUM

Every Package of the BRUNO GROSCHE & CO. SOLE IMPORTERS OF S.P.F. WATERPROOFER PRESERVER CANVAS WOOD PRESERVING OIL Genuine bears this label

Ask for our 16-page circular giving details about the illustrations shown herein, also reports of tests made with S. P. F. Carbolineum by European telephone administrations and by the Am. Tel. & Tel. Co.

BRUNO GROSCHE & CO.

25 WILLIAM ST. SOLE AGENTS NEW YORK CITY

MADISON TELEPHONE MFG. CO. MADISON, WIS. U.S.A.

SEND FOR BULLETIN

YOU OWE IT TO YOUR

Subscriber WHAT?

An I. T. M. Co. Phone. He will have no "kick coming," neither will you.

(60 Day Trial)

INDEPENDENT TELEPHONE MANFG. CO.

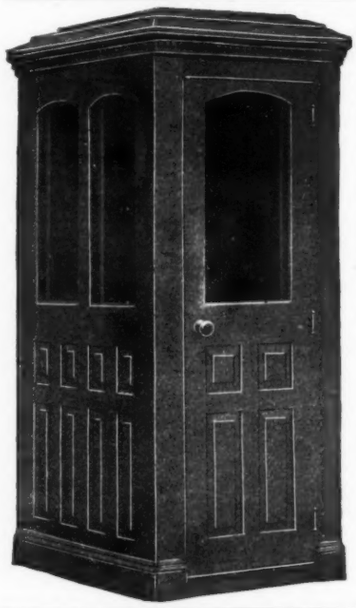
MADISON, - WIS.

SEND FOR NEW BULLETIN

SEND FOR NEW BULLETIN

SEND FOR BULLETIN

THE INVESTMENT IS A-1



Most questions are debatable, but the one,

"Resolved, that it pays to liberally install TELEPHONE BOOTHS,"

so far as we know, has no negative supporter.

If you refuse to argue the question, then give in and place your orders.

YESBERA MFG. CO., Toledo, O.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

A

More Durable

AND

Better Telephone

THAN THE

"Standard"

HAS

Never Been Made

ORDER OUR TYPE "E" TRANSMITTER

Standard Telephone & Electric Co.

Office and Factory - - Milwaukee

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Highest Award

ON

PROTECTORS

AT

World's Fair, St. Louis

The American Electric Fuse Company Exhibit of Protectors was awarded First Prize over all other competitors.
The judges said that the Kaisling Protector was the best they ever had seen.

ALL ENGINEERS SAY SO.

SO WILL EVERYBODY WHO TESTS IT.

AMERICAN ELECTRIC FUSE CO.

CHICAGO NEW YORK ATLANTA

MANUFACTURERS OF

THE KAISLING SELF-SOLDERING PROTECTORS

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Victory!

FRANK B. COOK BEATEN IN THE PATENT OFFICE.

THE KAISLING PROTECTOR DECLARED FREE FROM INTERFERENCE BY COOK

The Patent Office on August 12, 1904, decided the case of Frank B. Cook vs. William Kaisling. The decision is that "no interference in fact exists" between Kaislings' invention and Cook's patent claims.

This decision disposes of Frank B. Cook's oft-repeated claims to a monopoly on protectors. The limit of time for an appeal has now expired and the decision is therefore final.

The Kaisling Protector is the only absolutely non-infringing, self-soldering protector made. The Cook, Sterling and Rolfe protectors are all in litigation. The Patent Office decision leaves the Kaisling Protector absolutely free from any patent claims of others.

We will forward the full text of the decision to any one interested.

AMERICAN ELECTRIC FUSE CO.

CHICAGO NEW YORK ATLANTA

MANUFACTURERS OF

THE KAISLING SELF-SOLDERING PROTECTORS

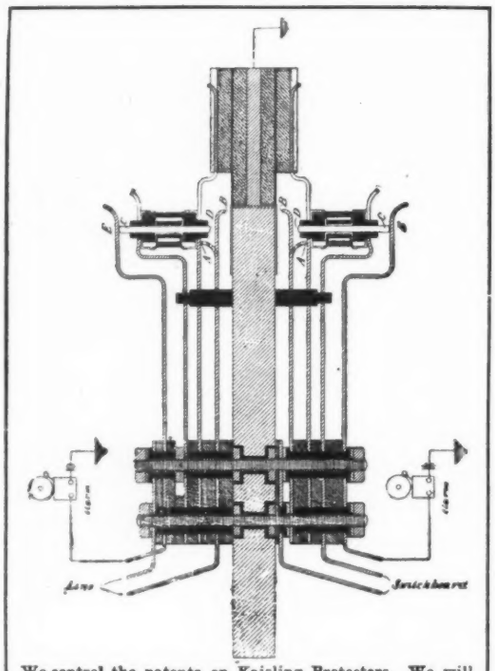
Buy The Protector That Has Been Decided to Be Absolutely Non-Infringing

The Kaisling

SELF-SOLDERING PROTECTOR

METHOD OF OPERATION

The pin C, which is not in the line circuit, is held normally in place by solder near its middle where it passes through a small copper spool. Insulated wire is wound around this spool forming the heat coil proper. The ends of the wire are soldered to the terminal caps of the cartridge, which make contact with the containing springs. The solder is not in the circuit at all. When the solder melts, the pin C is pressed inward by the strong spring E. The inner end of the pin moves the inside spring, striking it at point D and opening the circuit at point A. The point B is also forced over to ground. The circuit is thus opened and grounded by the operation of the coil. A local alarm circuit is also made through spring E, pin C and ground. The solder cooling, the coil is ready for use again by reversing it in the containing springs.



We control the patents on Kaisling Protectors. We will prosecute all infringers and guarantee our protectors not to infringe any valid patent. We protect our customers always.

A WARNING

Don't make it too easy for your trouble-man. Frank B. Cook advertises a so-called self-soldering protector designed to be re-set without removing the heat coil. In fact, it is practically *impossible* to remove the heat coil. *Such protectors are dangerous.* It is too easy to shove them back into place without a test.

A self-soldering heat coil should be easily removable. It always should be removed for test, after having been operated, a fresh, tested coil being inserted in its place on the frame. Easy going protectors are like easy going men, pleasant but not safe. Every exchange using self-soldering protectors should keep a small stock of tested coils always on hand to replace those that operate. When a number of coils have been operated, they should be carefully tested, and if found O. K., can be used again. Don't take chances just to save a second of your trouble-man's time.

ADVANTAGES OF THE KAISLING PROTECTORS

The first element of any protector is efficiency. The Kaisling, by test, is the safest and most efficient protector made. It always operates, never changes, and never opens the line except when operated by an excessive current. It is not a trouble maker. It repairs itself after every operation, and never wears out. We have operated a single coil over 2,000 times without change or loss of efficiency. The Kaisling protector is compact, measuring 2¼ inches per pair, and is simple, having only four working springs. It is well made, carefully tested, and sold at a very low price.

SEND FOR A FREE SAMPLE.

AMERICAN ELECTRIC FUSE CO.

CHICAGO NEW YORK ATLANTA

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Beware!

OF

FRANK B. COOK'S SO-CALLED SELF-SOLDERING PROTECTORS.

He Has No Patent On Them And They

INFRINGE

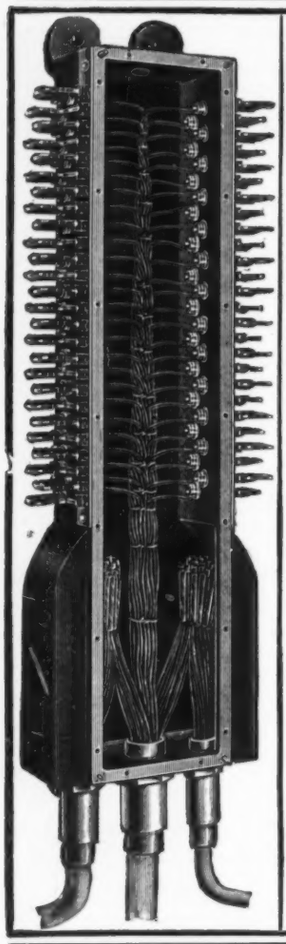
OUR PATENT RIGHTS

We are the original manufacturers of and own the exclusive pioneer patent rights covering *all forms* of self-soldering protectors.

Cook is an imitator and an infringer. Our broad claims have just been allowed by the patent office, and as soon as our patents issue we will commence suits for damages and ask for injunctions against Frank B. Cook and all other manufacturers and users of self-soldering protectors.

AMERICAN ELECTRIC FUSE CO.

CHICAGO NEW YORK ATLANTA



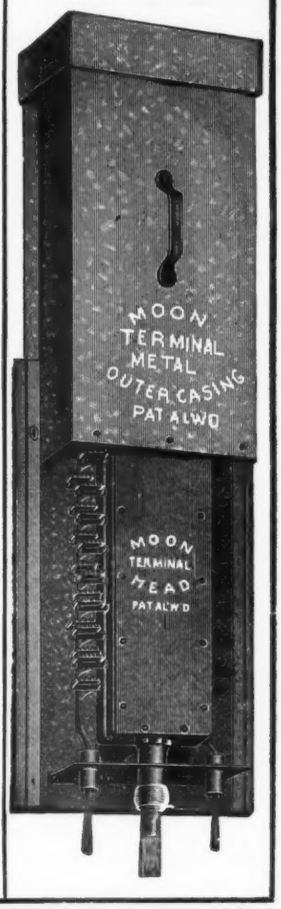
Moon Combination Terminal Head and Junction Box

NEW—PRACTICAL—ECONOMICAL

Used to combine or distribute cable in rearranginging old lines or adding new ones or in multiple distribution. Saves all outside splices and simplifies the work of installing cable. Affords ample room for splicing in an easy manner.

Has Fuse and Carbon Protection
Self-Soldering Nozzles
Metal Outer Case or Pole Box

Made with two or more nozzles for cables up to 200 pair or larger. The Self-Soldering Nozzles make it practical. :: Prices are practical, too.

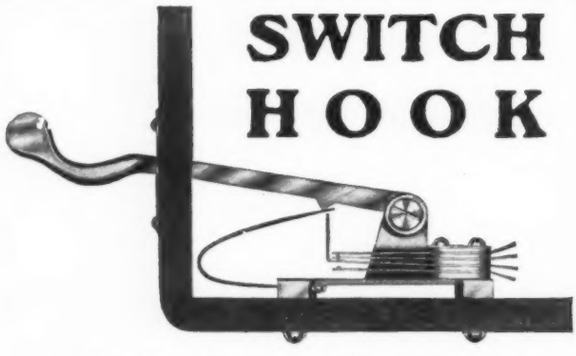


MOON MANUFACTURING CO.

43 SOUTH CANAL STREET, CHICAGO

We call attention to our new style

SWITCH HOOK



which has been pronounced by experts as

Electrically Perfect

Has four genuine platinum contacts and no pivot connections. Is perfectly BALANCED and

Entirely Self-Contained

In fact it is right in line with the entire output of this Company, whose aim it is to keep apparatus up to the highest standard of excellence.

The Williams Telephone & Supply Co.

72 Central Ave. **CLEVELAND, O.**

RESULTS COUNT

You get them with the

"1900" DRY BATTERY

Send a Trial Order to the Nearest Dealer, or Telephone Manufacturer.

Nungesser Electric Battery Co.

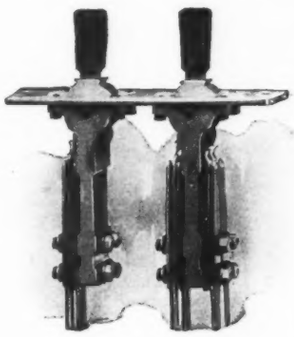
CLEVELAND

General Sales Office: 128 West Jackson Boulevard, CHICAGO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

IT IS HERE!
WHAT?
THE MONARCH SWITCHBOARD!
WHAT IS IT?

It is a board which embodies MONARCH ideas of simplicity, durability and efficiency; the characteristics of Monarch Telephones. It is another step toward perfection. You already know our habit of doing things right. The new board is no exception. This is the reason we were able to sell over 1,250 drops before we had completed the samples. We have the confidence of our customers.



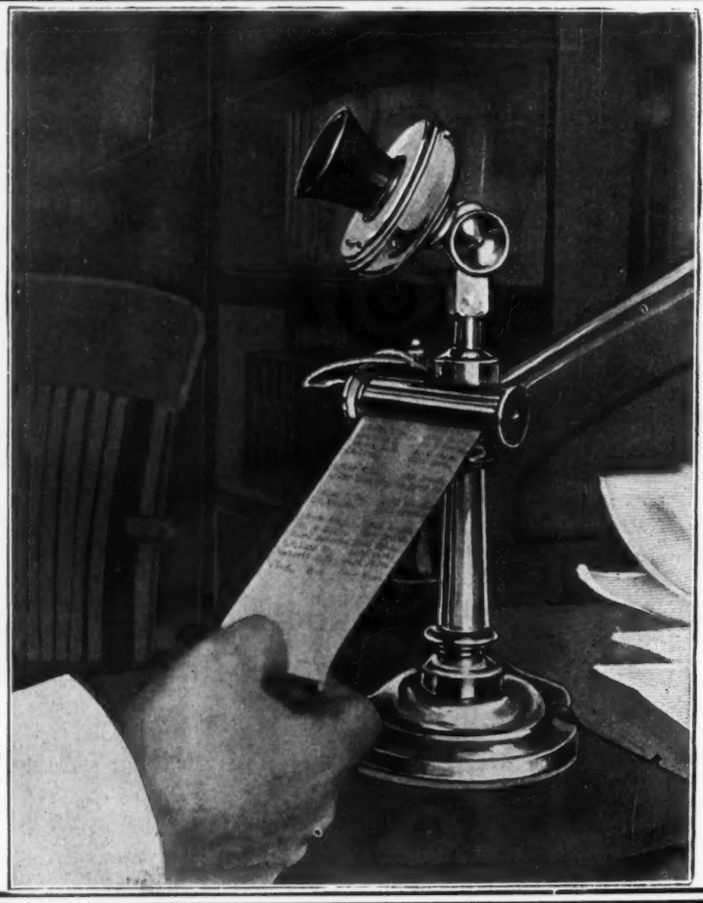
It will pay you to learn more regarding the construction of this board. We will be pleased to send you prices and a full description. Our guarantee covers all Monarch Products.

The keys shown above are parts of the new board. They are extremely simple and we guarantee that no trouble from sticking will be experienced. The rollers are hard rubber and are loose upon the spindles. There are no small parts to work loose and get lost. The frame is of brass and the construction is substantial. Write for a more complete description.

MONARCH TELEPHONE MFG. CO.

12-16 South Clinton Street Chicago, Illinois

Please tell the Advertiser you saw his Announcement in TELEPHONY.



We Have What You Want.

Saves brain work and hours of time. Busy man's friend. A ready index call device for telephones. Necessity to every user of the telephone.

Just the thing for listing of names and call numbers, does away with the writing of names and numbers all over the wall, woodwork, frosted windows, pieces of paper and tacking upon the wall, in books and misplacing and not able to find when wanted.

For constant communication with customers, the appliance is indispensable. Home use, for listing such names as the grocer, butcher, doctor, druggist or friend, it fills a long felt want.

Made of spring steel and brass, highly nickel plated to match telephone.

Easily attached to wall or desk 'phone and is so simple a child can operate and understand it. Directions sent with appliance.

Names and numbers can be alphabetically arranged on the ribbon by pen, pencil or typewriter and found instantly.

Retails for $1.50.

Rapid seller. Seeing's believing.
Special inducements to agents.

Telephone Appliance Company

Dept. A, 1 Madison Ave. **NEW YORK CITY**

Washington Fir Cross Arms Last twice as long as Ordinary Arms. Are Stronger than other arms. Absolutely Free from knots or defects of any kind. Prices average as low as asked for Pine Arms.

Washington Fir Trees.

These trees often attain a height of 90 to 100 feet before branching. The logs are sometimes sixteen, eighteen or twenty feet in diameter, and are never hollow.

Knoxville, Iowa, June 25, '04
Illinois Electric Co., Chicago.

Gentlemen:—The Washington Fir Cross Arms recently received from you are the finest lot of Arms that we ever saw. They are of uniform quality, of excellent grain and soundness. The mill work and borings have been very carefully done according to specifications. It was impossible to pick out the best arm, as we usually do, for places of heavy strain, as they were all apparently of the best quality. How anyone would think of using pine arms when these can be had at the price we paid for them we are at a loss to understand, as we certainly consider them the cheapest Arm we have ever bought. We thank you for your promptness in shipping.

Yours truly,
Knoxville Electric Co.
P. E. Bellamy, Gen. Mgr.

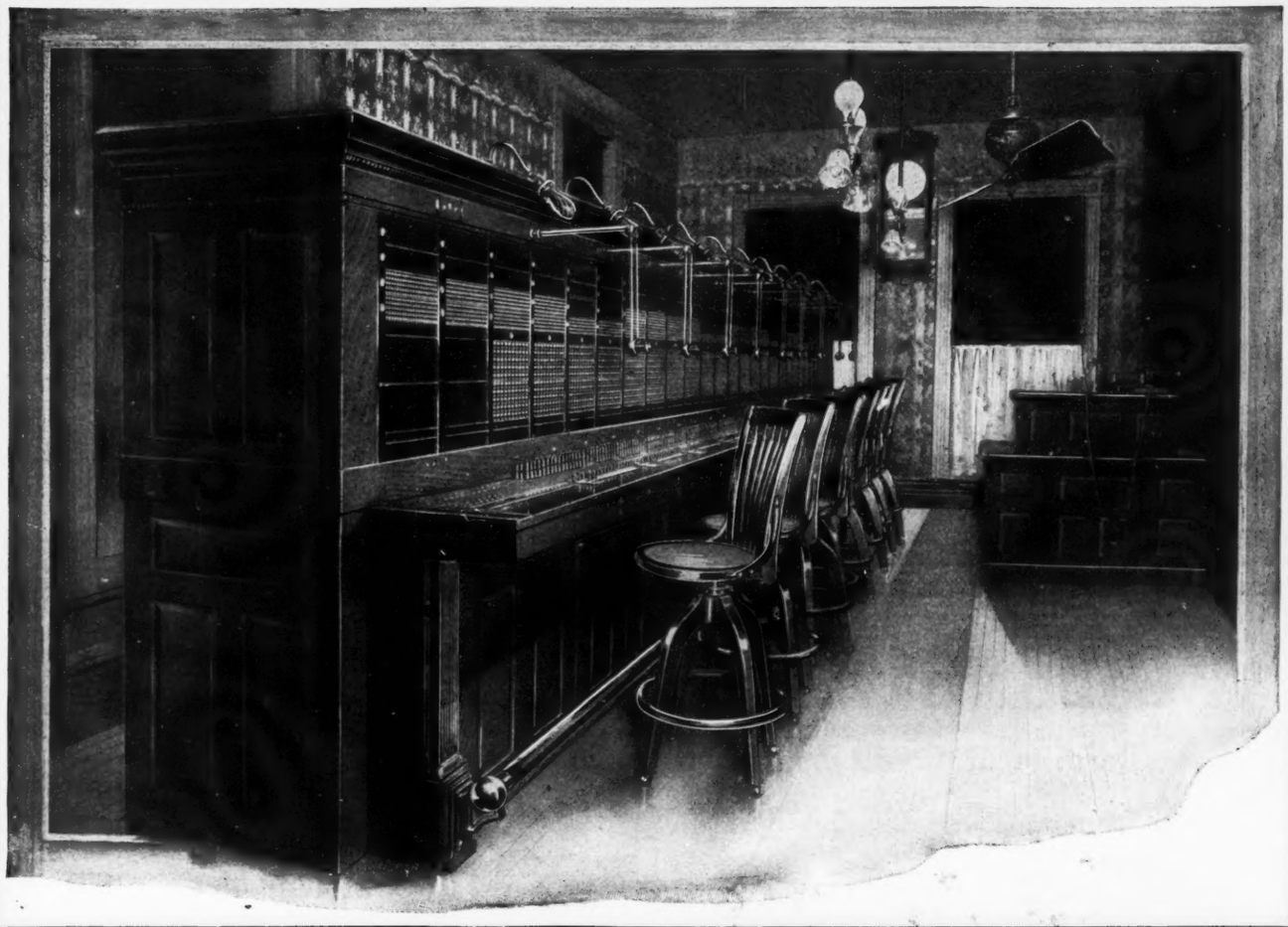
Illinois Electric Company,

Electrical Supplies,

239-241 Madison Street, CHICAGO.

Please tell the Advertiser you saw his Anncuncement in TELEPHONY.

Where Quality Stands First



MAKERS OF TELEPHONE APPARATUS

Multiple Boards — Transfer Boards — Village Boards
Central Energy — Magneto Call
Exchange Telephones — Rural Telephones — Factory Telephones

MANUFACTURED DIRECT FROM THE RAW MATERIAL

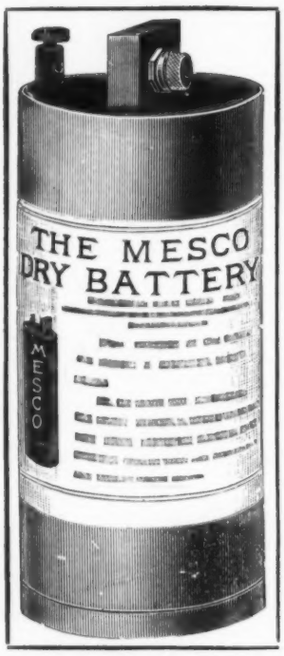
THE NORTH ELECTRIC COMPANY

WRITE FOR CATALOG

149-159 Clair St., CLEVELAND, OHIO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

The Mesco Dry Battery



The Best Dry Battery Manufactured for Telephone Service

WHY?

Because! The best obtainable materials are used in its construction.

There is no deterioration when not in use.

It gives the longest and steadiest service on intermittent work.

It keeps the Expense Account down.

One of the largest telephone systems in this country have used Mesco Dry Battery since 1892. They have given all the different dry batteries practical tests, and use the Mesco because it saves them money, basing figures on time of service, cost, etc.

GET OUR PRICES ON PINS, BRACKETS, CROSS ARMS AND GALVANIZED IRON WIRE.

We carry a large stock of high grade Rubber Covered Telephone Wire Nos. 16, 18 and 19, B and S guage, single or double conductors, plain or saturated braid on which we quote very low prices.

Samples and quotations furnished on application.

MANHATTAN ELECTRICAL SUPPLY CO.

CHICAGO
186-188 Fifth Avenue.

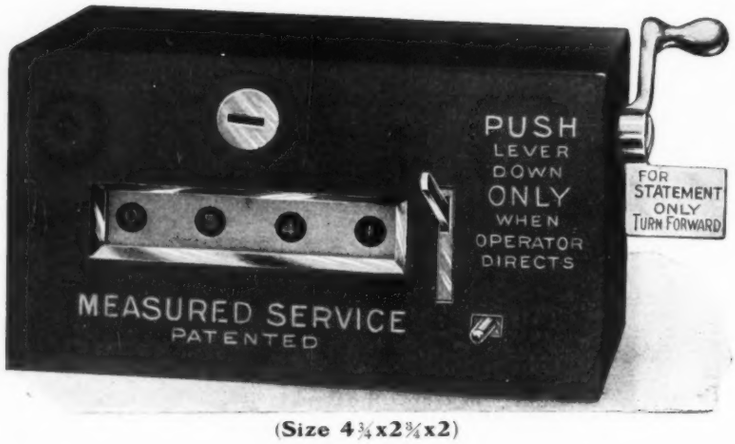
NEW YORK
32 Cortland St. 39 Day St.

JERSEY CITY
42-46 Essex St. 41-47 Morris St.

A Labor Saver and a Patron Maker

Permits of Credit System to Customer at any rate per call.

Motto: "ECONOMY"



(Size 4¾x2¾x2)

Takes Statement Over Wire
of accumulated calls.

Under Control of Central Office.

"Number?—Register."

[That's all the operator says.]

Ask us
for Particulars

Measured Service Company

153-159 South Jefferson Street, CHICAGO

Please tell the Advertiser you saw his Announcement in TELEPHONY.

You Press the Button on Our

"Non-Interfering" Bridging Telephone

When You Call Central and No Other Party on Your Line Can Hear the Signal

To call a party on your line, call in your usual manner without using the push button. Central gets a signal only when you push the button.

Isn't it Worth Something to be able to call Central and not have Every Other Party on the Line Rubbering ?

This telephone must be used on metallic lines, but if you are building grounded lines it will pay you to put in this telephone, because sooner or later you will run metallic circuits.

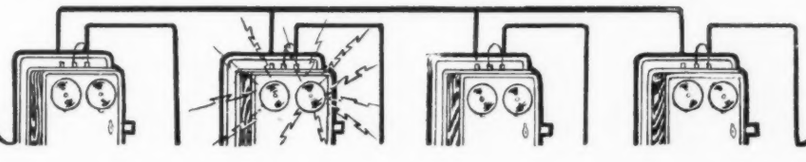
This telephone, and many others fully described in our bulletins.

Write for Telephone Book No. 11-C.

STROMBERG-CARLSON TELEPHONE MFG. CO.

GENERAL OFFICES
ROCHESTER, N. Y.

WESTERN SALES OFFICE
CHICAGO, ILL.



Please tell the Advertiser you saw his Announcement in TELEPHONY.

QUEEN! QUEEN!

Our Secretary has just been married and now he has a "Queen" of his own. Why don't you get a

"Queen" Soldering Stick

"Queen" Soldering Paste and

"Queen" Coloring Fluids and Frosting Compound

Once Tried Always Used

Carried in stock by

MONARCH ELECTRIC & WIRE CO.

CHICAGO, ILLINOIS

Exclusive Agents for the northwest

ARE YOU SATISFIED

with the results obtained from your present equipment?

NO

Then let us tell YOU why YOU should get in line NOW, and adopt EUREKA APPARATUS. We have satisfied over Three Thousand Companies; have MADE more SWITCHBOARDS than any other manufacturer. Experience teaches, don't it? WE KNOW HOW.

SOME NEW THINGS

FULLY DESCRIBED IN OUR NEW NO. 33 CATALOGUE READY FOR DISTRIBUTION

Write us. And do it now.

EUREKA ELECTRIC CO.

Makers of Everything Needed to Equip a Telephone Exchange.

Factory and General Office, GENOA, ILLINOIS.

Sales Department, Monadnock Block, CHICAGO.

"Independent Telephone Practice" for the asking.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Intercommunicating Wall and Desk Telephones

For Warehouse, Office, Factory, etc. We manufacture our own apparatus and maintain a high standard and guarantee our instruments to be perfect electrically and mechanically.

Workmanship is of the best and only materials are used that will give perfect service under most severe conditions.

Estimates furnished on application for complete installations except labor.

Everything in Telephones and Telephone Supplies.

GENERAL TELEPHONE CATALOGUE No. 19
TELEPHONE PARTS CATALOGUE

Electric Appliance Company

TELEPHONE MANUFACTURERS & ELECTRICAL SUPPLIES

Chicago and San Francisco

Please tell the Advertiser you saw his Announcement in TELEPHONY.

OUR TELEPHONE APPARATUS

Stands for Quality, Durability and Efficiency. There are no better instruments made than our "Willams-Abbott" and "Central." Our transmitters are the solid back type, clear and distinct; our generators are ample and our bells loud ringing.

Our stock of construction material and appliances is also large and our prices attractive. We particularly recommend **OKONITE** for use wherever rubber covered wires are needed. ∴ ∴

Central Electric Company,

Elecrical Supplies

264-266-268-270 FIFTH AVENUE CHICAGO

Look for the Tags

They are your protection against inferior quality

Our

Telephone and Telegraph Wires

are

Extra Double Galvanized

with the finest grade of pure zinc. Every bundle bears a tin tag and lead car seal, as shown in the photographs, and is

Guaranteed Standard Quality

THE NATIONAL WIRE CORPORATION

WORKS: NEW HAVEN, CONN.

General Offices: Engineering Building, 114-116 Liberty St., NEW YORK, N. Y.

Sales Offices and Warehouses:

New York, Boston, Chicago, DeKalb, Kansas City, San Francisco

WIRE ROPE ∴ WIRE STRAND

Ask for Special Price Lists, with Tables.

Please tell the Advertiser you saw his Announcement in TELEPHONY.

American Electric Telephone Co.

CHICAGO, ILL.

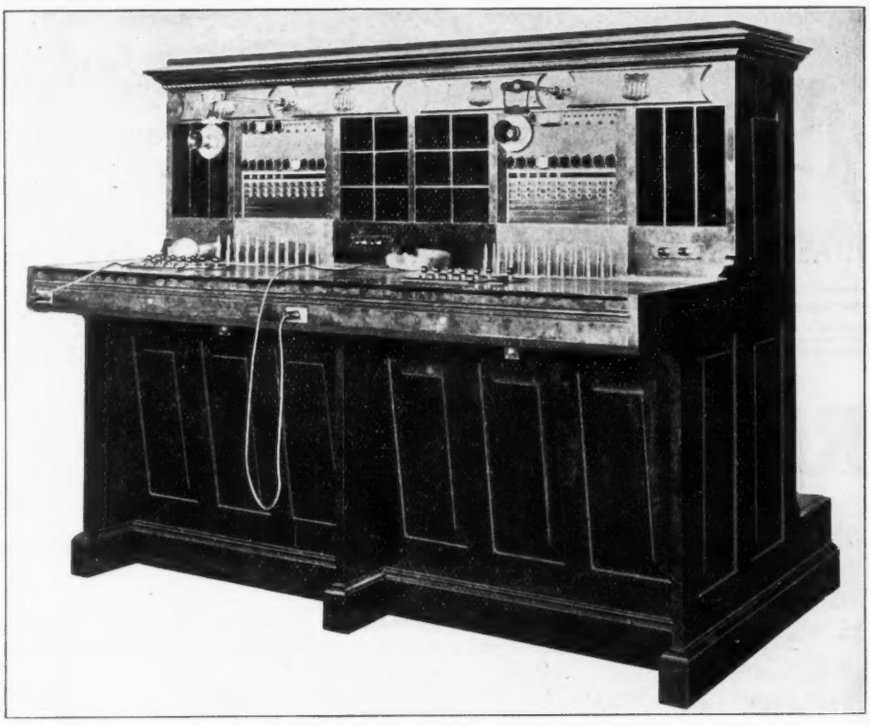
Largest Manufacturers of Complete Telephone Exchanges and Equipments

MAGNETO and CENTRAL ENERGY SWITCHBOARDS
MAGNETO and CENTRAL ENERGY TELEPHONES

Terminals

Toll Boards

Supplies



Protective Apparatus

Private Branch Exchanges

Power Equipment

TOLL BOARD

The above toll board is a sample of our high class work.
We have built the largest toll boards now in use.

Write to us for prices and particulars.

Our new descriptive bulletins are just out. Send for them.

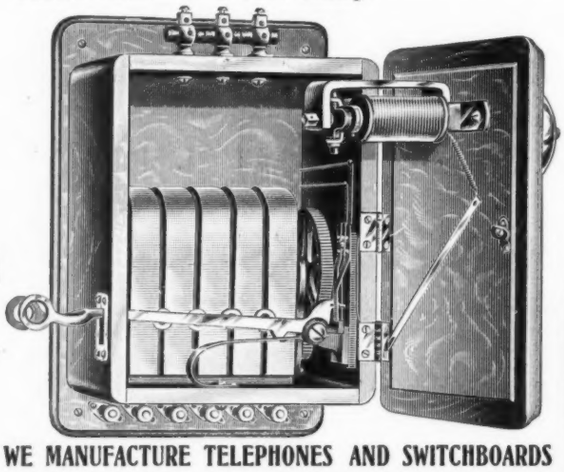
Please tell the Advertiser you saw his Announcement in TELEPHONY.

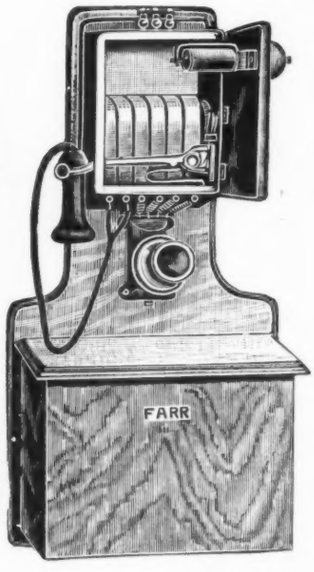
OUR NEW CATALOGUE No. 17

FIVE HUNDRED ILLUSTRATIONS, CONTAINS THE FOLLOWING:

How to Build Telephone Lines, How to Install Telephones, Faults in Telephones—How to Remedy, Induction Explained, Weights and Resistance of Wires, Estimate of Material for Exchange of Fifty Telephones, Methods of Connecting Repeating Coils, Diagrams of Bridged and Series Telephones, Condenser for Telephone Shunt, Wiring of Transmitter Arm Base and Induction Coil, How to Wire Line to Fuse Block.

Catalogue Sent Free to any owner of telephones or manager. All others enclose a 2-cent stamp.





WE MANUFACTURE TELEPHONES AND SWITCHBOARDS

A full line of Telephone Supplies, Linemen's Tools. Prices the lowest. Brackets, Glass Insulators, Cross Arms, Pins, High Grade Galvanized Iron Wire.

FARR TELEPHONE AND CONSTRUCTION SUPPLY CO., 118 AND 120 WEST JACKSON BLVD., CHICAGO

BAIRD PAY STATIONS PAY

tremendous profits on the investment as is proven by

Increased Dividends and Improved Service!

We are constantly receiving repeat orders for our apparatus from our many customers which proves conclusively that

BAIRD PAY STATIONS PAY!

Write for catalogue or information to

BAIRD MANUFACTURING COMPANY

3 Michigan Street : : : CHICAGO, ILLINOIS

Please tell the Advertiser you saw his Announcement in TELEPHONY.

Send for our new booklet entitled

A Business Proposition

Give us an opportunity to tell you about

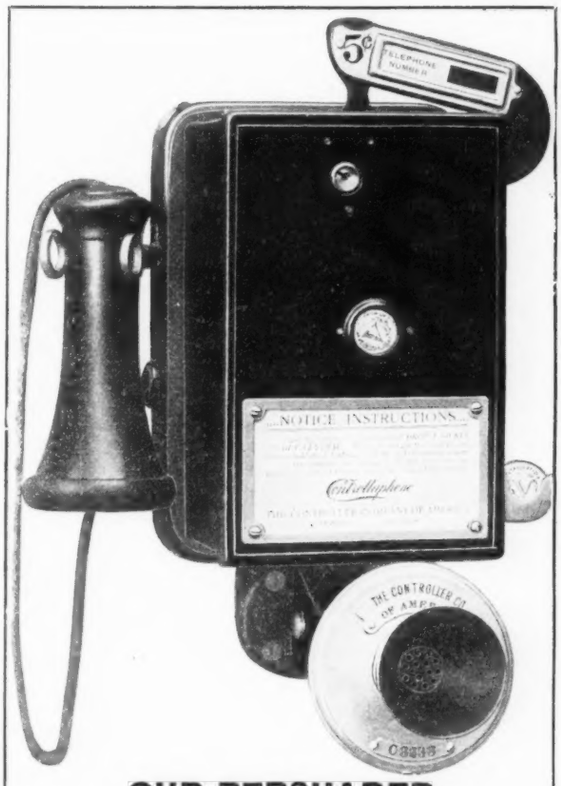
MEASURED SERVICE

Have you seen us at the Fair? Sec. 19, Electricity Building.

Stroud. Controllers are doing heavy duty all over the World's Fair ground on the Independent service.

See our Controller for Megneto Systems.

We have the first practical automatic telephone controller.—See it work.



OUR PERSUADER

Are you troubled with dead heads?

Are your rates too low to let you make money?

Are you trying to raise your rates? If so, don't do it until you have first talked with us. There's a better and simpler way.

Send for bulletin No. 6, it tells all about it.

Ou Controller makes the public put the money in first.

The Controller Company of America

CHICAGO
1061 Monadnock Block

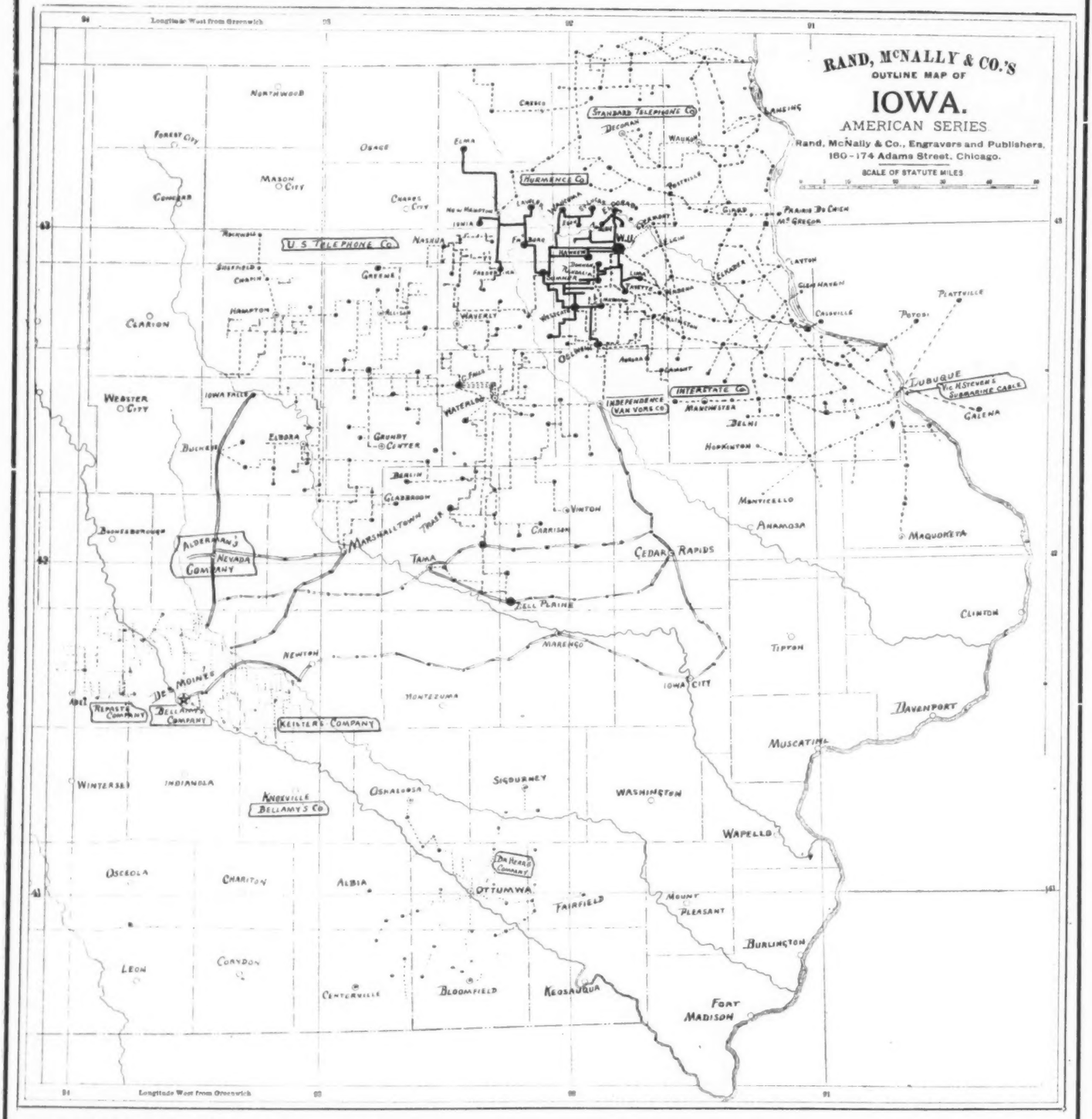
ST. LOUIS
Woman's Magazine Building

Please tell the Advertiser you saw his Announcement in TELEPHONY.

TO THE PEOPLE OF IOWA:

This map shows how any number of Telephone Companies can combine for long distance business.

Under Sec. 2161 of the Code of Iowa the Telephone Companies and the Railway Companies can be made to recognize this combination. The farmer is going to be the absolute dictator of the telephone business and no person and no corporation can oppose him and live. Now is the time to meet the farmer and get him to do right.



TO THE PEOPLE OF IOWA: The Rogers Telephone Company for West Union through C. H. Talmadge, T. L. Green, F. Y Whitmore, H. P. Hancock, Omar A. Roger, and myself have come to an arrangement with Vic H. Stevens, Ed. A. Hurmence, J. H. Shoemaker and Paul Patton through which all of their above marked lines will be connected for toll or long distance service. A standard basis for serving the farmer or mutual companies is being worked out. The Pleasant Ridge Telephone Company is a farmer owned company. Ambrose McGaharen is the long term director in this Company. We will make a deal with him in the early days of November through which a model will be had for town and farmer service combined. *We eagerly desire the farmer business.*

SUMMARY

October 1903—Standard account for telephone plants was published in Telephony.
April 1904—The Roger Telephone Company for West Union was incorporated upon lines of such account.
August 1904—The Rogers Telephone Company for Iowa was incorporated.
September 1904—The Rogers Telephone Company for Illinois was incorporated.
October 1904—The Rogers Telephone Company for Iowa has made relation with Ed. A. Hurmence, Vic H. Stevens, J. H. Shoemaker, Paul Patton and Ambrose McGaharen which will result in a community of interest for the whole Independent telephone business in twenty cities. We shall support these men in this plan.

West Union, Oct. 20, 1904.

OSCAR WENTWORTH ROGERS.

To the People of Iowa.

For over ten years I have been thinking and working, night and day, to perfect my inventions. They cover every industrial proposition.

I do not purpose that my inventions shall be handled by any others than my friends and myself. In former communications I have stated who these friends are. They are with me yet, and others are coming very fast.

Inventors have usually been denied the legitimate profits from their inventions.

J. R Edson (in Appendix to Congressman J. A. Tawney's speech of Feb. 7, 1903, on "Extension of Letters Patent"):

"Of the total benefits of inventions only about 2 per cent went to inventors."

W. C. Dodge (Sen. Doc. 438, 1st Session, 56th Cong.)

"Arnout, the great French war minister, said to Jaquard, the inventor of the loom, 'are you the man who can do what the Almighty cannot—tie a knot in a stretched string?'"

"Kay who invented the flying shuttle in 1733; Hargreaves, the spinning jenny; Awkright, the spinning frame; Crompton, the mule spinner; Cartright, the power loom, and who spent $150,000 in effort to protect his patents—all of them had their machines destroyed by ignorant mobs. Kay was ruined by expensive lawsuits in the effort to protect his patent from infringement by wealthy and unscrupulous parties."

"Goodyear reduced himself to poverty before his grand success, one witness testified: "I found in 1839, that they had not fuel to burn or food to eat, unless it was sent in to them."

"Jethro Wood, inventor of the modern iron plow was defrauded of all benefit from his patent by infringers."

"Morse struggled for years to secure attention to his telegraph invention: at times he had but a single meal in 24 hours.

"It was years after Nasmyth invented his steam hammer, before he could induce the government to even try it."

"When the B. & O. R. R. was opened with horse cars in 1830, Daniel Webster expressed grave doubts as to railroads, saying, among other (silly) things, that the frost on the rails would prevent the train from moving, or from being stopped if it did move."

(Pat. Comr. Fisher's report O. G., Vol. 1, p 8.)

"The protection afforded by the patent and the hope of reward have proved the incentives to invention. (The people) do not deem it too much that the patent office, which is the only institution that they can properly call their own, and which they have built up with their own money, and established by their genius, shall be supplied upon a liberal scale with every appliance for the performance in the best manner of all legitimate duties."

Patent Centennial Celebration p. 480.

Patent Comr. Fisher: "*No class of citizens have done more for the glory and prosperity of our nation than the inventors and mechanics of the United States, and they have never been favored children.* What is now needed is the protection of the system, better and more complete means for carrying it on, *and more effectual means for protecting the inventor.*"

To-day, as then, "wealthy and unscrupulous parties" and "frenzied financiers" constantly attempt to nullify the constitutional and legislative protection for the inventor. The Bell Telephone Company has been one of the worst of these financial desperadoes. Take a brief review of the subject of telephony.

1854—CHARLES BOURSEUL: "I have asked myself if the spoken word itself might not be transmitted by electricity: in a word if what is spoken in Vienna may not be heared in Paris?

The thing is practicable in this way: Suppose a man speaks near a movable disk sufficiently flexible to lose none of the vibrations of the voice; that this disk alternately makes and breaks the connection with a battery: You may have at a distance another disk which will simultaneously execute the same vibrations. This mode of transmission requires no apparatus except an electric battery, two vibrating disks, and a wire. The increase of pressure between two electrodes in constant contact produces a diminution in their electric resistance."

1833—JOHANN PHILIPP REIS, had two electrodes in constant contact—with a press screw and two springs to keep them together. And yet Prof. Cross—"expert" for the Bell testified, in speaking of Reis' transmitter, "I do not deny the possibility that in spite of the endeavors of Reis to prevent it, the circuit may have remained unbroken, and some sounds have been transmitted by the production of electrical undulations." (Dolbear Record—508-515).

Reis' transmitter was exactly duplicated by the Bell's Blake transmitter. One works exactly as well as the other *if no carbon electrodes are put in.*

Reis' Receiver is exactly the receiver of to-day—except the mere form. Bell took Reis' receiver for a model—changed Reis' strap or strip steel diaphragm to a circular steel diaphragm and enclosed it in a rubber cylinder.

(*126 U. S. Sup. Ct. Report, p. 537:*) "The current (circuit) must be kept closed to be used successfully, but this does not imply that it must be produced or so operated upon, as to be incapable of being opened. If opened it will fail to act for the time being, and the process will be interrupted, but there is nothing in the patent which requires it to be operated by instruments which are incapable of making the break."

(Prof. Cross—Bell "expert"—in McDonough case.)

* *Int. 135.*—You know it to be a fact, do you not, that the electrodes of a Reis' transmitter can be so adjusted * * that it will transmit speech?

Ans. I have been able to transmit speech intelligently by speaking gently to a Reis' transmitter in circuit with a battery and Bell magneto receiver.

* *Int. 136.—At such times as you understand it, the Reis' instrument is producing undulations similar in form to the air waves?*

Ans. It is.

* *Int. 137—And embodies the invention of Bell's fifth claim of the patent of 1876?*

Ans. I understand that it does when so operated.

Bell's apparatus of the patent of 1876 never operated as a transmitter. *The electrodes cannot come together. The circuit is always open except purely magnetically considered.*

After Reis, (using a battery or Lenz Law current), only special patents, (like Edison's carbon transmitter), could be had. Reis gave his discovery to the world in 1863. About 1876, Bell got into the hands of some "wealthy and unscrupulous parties." They bought off the Western Union. They bought the Edison and Berliner patents and claims from Western Union. They succeeded in blinding the judical eyes of a bare majority of the Supreme Court; and yet Reis' work, (after Bourseul's declarations), when read in view of Faraday's law, completely exposes the falsity of Bell's famous or infamous fifth claim.

"*A method of, and apparatus for,* transmitting vocal or other sounds telegraphically *as herein described,* by causing electrical undulations similar in form to the vibrations of the air, accompanying the said vocal or other sounds, substantially as set forth."

If any scientist will stop to think of it—he will see that the Faradic laws (1831 to 1850), and the then well known laws of acoustics settled that the electrical undulations on the line of any charged telephone circuit are similar in form to the vibrations of the air and the wire accompanying the make and break of the circuit caused by the vibrations of the diaphragm. The electrical phenomena is entirely apart from the "vibrations of the air accompanying vocal sounds." And yet Bell was given a temporary monopoly upon a valuable thing which had already been given to the world by a real scientist.

Such was the beginning of the Bell monopoly.

See the Berliner case! See the Carty cases! In spite of it, all the farmers are sweeping the Bell away.

My inventions will be used to help the honest Independents of our land. I nave converted Ed Hurmence, J. H. Shoemaker, Paul Patton and Vic Stevens. These men control the telephones in over twenty Iowa counties. We have come to an arrangement. We shall deal with the farmer companies in a standard way.

Every time some supposed expert or some Sound Waves sage jeers at my claims he helps me by warning me where a vicious thing lies coiled.

The patent office belongs to the people of this land. In the main the workers therein have been faithful and honest.

The exceptions are such cases as the Bell's creatures getting information from the files. (See Seymour's letter to Starrow.)

We are going carefully and we have no fear of the decaying Bell monstrocity. The Patent office is square now. The Government is square. The "wealthy and unscrupulous parties" and "frenzied financiers" have no control of this and the coming administration.

OSCAR WENTWORTH ROGERS

West Union, Oct. 20, 1904.

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN ILLINOIS

Faller Automatic Operator. ALL LINES UNDERGROUND.

ITEMS	Place: Chicago 1,698,575 — Acct.	Over 25,000, under 50,000 — TOWNS: Name	Pop.	Proposed Plant: Acc't	Over 10,000, under 25,000 — TOWNS: Name	Pop.	Proposed Plant: Acc't	Over 5,000, under 10,000 — TOWNS: Name	Pop.	Proposed Plant: Acc't	Over 2,000, under 5,000 — TOWNS: Name	Pop.	Proposed Plant: Acc't
		East St. Louis	29,655		Alton	14,210		Belvidere	6,937		Abingdon	2,022	
		Joliet	29,353		Aurora	24,147		Blue Island	6,114		Aledo	2,081	
Business Phones	30,000	Quincy	36,252	800	Belleville	17,482	500	Canton	6,564	250	Anna	2,618	100
Residence Phones	60,000	Rockford	31,051	1,700	Bloomington	23,286	1,000	Centralia	6,721	500	Batavia	3,871	300
Business Rates	15	Springfield	34,159	15	Cairo	12,566	15	Champaign	9,093	15	Beardstown	4,827	15
Residence Rates	10	Peoria	56,100	10	Danville	16,354	10	Charleston	5,488	10	Braidwood	3,279	10
Av. Length Lines	½m.		216,580	½m.	Elgin	22,433	½m.	Chicago Hgts	5,100	½m.	Bushnell	2,490	½m.
Percentage Conduits	100			100	Evanston	19,259		Dekalb	5,904		Carbondale	3,318	
Connectors per 100 Subscribers					Freeport	13,258		Dixon	7,917		Carlinville	3,502	100
					Galesburg	18,607	100	Galena	5,005	100	Carmi	2,939	
					Jacksonville	15,078		Harvey	5,395		Carrollton	2,355	
					Kankakee	13,595		Kewanee	8,382		Carthage	2,104	
					La Salle	10,466		Lincoln	8,962		Chester	2,832	
					Moline	17,248		Litchfield	5,918		Clinton	4,455	
					Ottawa	10,588		Macomb	5,375		Coal City	2,607	
					Rock Island	19,493		Mattoon	9,622		Collinsville	4,021	
					Streator	14,079		Monmouth	7,460		Decatur	2,075	
						282,129		Mount Vernon	5,216		Downer's Grove	2,103	
								Murphysboro	6,463		Dundee	2,765	
								Oak Park	7,500		Du Quoin	4,353	
								Pana	5,530		Dwight	2,015	
								Paris	6,105		Edwardsville	4,157	
								Pekin	8,420		Effingham	3,774	
								Peru	6,863		Fairbury	2,187	
								Springvalley	6,214		Fairfield	2,338	
								Sterling	6,359		Flora	2,311	
								Urbana	5,728		Fulton	2,685	
								Waukegan	9,426		Galva	2,682	
									189,728		Geneseo	3,356	
											Geneva	2,446	
											Gibson City	2,054	
											Granite	3,122	
											Greenville	2,504	
											Harlem	4,085	
											Harrisburg	2,202	
ESTIMATED COST											Harvard	2,602	
											Harvard Junc	2,602	
Central Equipm't	$1,800,000										Havana	3,268	
Subscribers "											Highland Park	2,806	
Building	150,000										Hinsdale	2,578	
Conduits	750,000										Hoopeston	3,823	
Armoured Cables	1,106,280										Hospital	2,500	
Manholes	138,000										Jerseyville	3,517	
Engineering Exps	300,000										Lagrange	3,969	
Contingencies	150,000										Lake Forest	2,215	
Distributing, &c	1,086,000										Lemont	2,449	
											Lewistown	2,504	
											Lockport	2,659	
Total	$5,474,280			$152,065			$91,238			$45,619			$24,360
											Marengo	2,005	
											Marion	2,510	
											Marseilles	2,559	
											Marshall	2,077	
											Mascoutah	2,171	
											Maywood	4,532	
											Melrose Park	2,592	
											Mendota	3,736	
											Metropolis	4,069	
											Minonk	2,545	
											Momence	2,026	
Capitalization per Phone	61			61			61			61	Morgan Park	2,329	61
											Morris	4,273	
DEPRECIATION											Morrison	2,308	
											Mound City	2,705	
Conduits, 3%	$108,720										Mount Carmel	4,311	
Other Plant, 6%	105,000										Mount Olive	2,935	
Total	$213,720			$5,940			$3,562			$1,781			$960
											Naperville	2,629	
											Nashville	2,184	
											Normal	3,795	
											North Peoria	2,358	
											Olney	4,260	
											Paxton	3,036	
											Petersburg	2,807	
											Pinckneyville	2,357	
											Pittsfield	2,293	
											Pontiac	4,266	
											Princeton	4,023	
											Rochelle	2,073	
											Rockfalls	2,176	
EXPENSES											Roodhouse	2,351	
											Rushville	2,292	
Engineer and Manager	$45,000										Sandwich	2,520	
Assistants	21,600										Savanna	3,325	
Sec.-Tr. and Bookkeepers	27,000										Shelbyville	3,546	
Storekeepers	10,800										Sparta	2,941	
Stenographers	28,800										St. Charles	2,675	
120 Inspectors @ $720	86,400										Staunton	2,786	
Heat, Light, &c	30,000										Sullivan	2,399	
Total	$249,600			$6,950			$4,160			$2,750			$1,500
											Sycamore	3,653	
											Taylorville	4,248	
											Toluca	2,629	
											Tuscola	2,569	
											Upper Alton	2,373	
											Vandalia	2,665	
											Venice	2,450	
											Virden	2,280	
											Warsaw	2,335	
											Waterloo	2,114	
											Watseka	2,505	
SUMMARY											West Hammond	2,935	
											Wheaton	2,345	
Revenue	$1,050,000			$29,000			$17,500			$8,750	Whitehall	2,030	$4,500
8% on Capital	437,492			12,165			7,299			3,650	Wilmette	2,300	1,948
Depreciation	213,720			5,940			3,562			1,781	Woodstock	2,502	960
Expenses	249,600			6,950			4,160			2,750		287,934	1,500
Surplus	148,738			3,945			2,479			569			92

OSCAR WENTWORTH ROGERS' ESTIMATE FOR TELEPHONE PLANTS IN ILLINOIS

Faller Automatic Operator. ALL LINES UNDERGROUND.

Over 1,000, under 2,000

TOWNS		Proposed Plant	TOWNS		Proposed Plant
Name	Pop.	Acc't	Name	Pop.	Acc't
Albion	1,162		National St'k Yds	1,000	
Altamont	1,335		Nauvoo	1,321	
Amboy	1,826	75	Neoga	1,126	75
Arcola	1,995	125	Newman	1,166	125
Arlington H'ghts	1,380	15	Newton	1,630	15
Ashland	1,201	10	Niiwood	1,378	10
Assumption	1,702	½m.	Nokomis	1,371	½m.
Astoria	1,684		North Chicago	1,150	
Athens	1,535	100	North Utica	1,150	100
Atlanta	1,270		Oakland	1,198	
Auburn	1,281		Odell	1,000	
Augusta	1,149	.....	Odin	1,184	.....
Averyville	1,573		O'Fallon	1,267	
Barrington	1,162		Olgesby	1,000	
Barry	1,643		Ornaga	1,270	
Bemes	1,484		Orquawka	1,010	
Benton	1,341		Oregon	1,577	
Braceville	1,669		Palatine	1,024	
Bradley	1,518		Park Ridge	1,430	
Breese	1,571		Pecatonica	1,045	
Brooklyn	1,019		Peotone	1,003	
Bunker Hill	1,378		Piano	1,634	
Byron	1,015		Polo	1,869	
Cambridge	1,345		Prophetstown	1,143	
Camp Point	1,260		Rantoul	1,207	
Carbonhill	1,252		Redoud	1,169	
Carlyle	1,874		Ridgely	1,169	
Carpentersville	1,002		River	1,539	
Cartersville	1,749		Riverside	1,551	
Casey	1,500		Riverton	1,511	
Cerrogordo	1,008		Robinson	1,683	
Chatsworth	1,038		Roseville	1,014	
Chenoa	1,512		Rossville	1,435	
Chillicothe	1,699		Salem	1,642	
Cobden	1,034		Sandoval	1,258	
Colchester	1,635		Seneca	1,030	
Colfax	1,153		Shawneetown	1,698	
Columbia	1,197		Sheffield	1,265	
Cuba	1,198		Sheldon	1,103	
Delevan	1,304		Sorento	1,000	
Des Praines	1,666		St. Anne	1,000	
Dolton's Station	1,229		St. Elmo	1,050	
Earlville	1,122		Sumner	1,268	
East Dubuque	1,146		Toulon	1,057	
Edinburg	1,071		Trenton	1,706	
Eldorado	1,445		Troy	1,080	
Elmhurst	1,728		Utica	1,150	
Elm Wood	1,582		Vermont	1,195	
		$12,180			$12,180
Elpaso	1,441		Vienna	1,217	
Eureka	1,661		Virginia	1,600	
Farmer City	1,664		Warren	1,327	
Farmington	1,729		Washington	1,459	
Forreston	1,047		Waverly	1,573	
Fort Sheridan	1,575		Wenona	1,486	
Freeburg	1,214		West Chicago	1,877	
Gardner	1,036		Wilmington	1,420	
Gilman	1,441		Winchester	1,711	
Girard	1,661		Winnetka	1,833	
Glen Carbon	1,350		Winstanley	1,055	
Germantown	1,782		Wyoming	1,277	
Glencoe	1,120	61		238,090	61
Golconda	1,140				
Genoa	1,140				
Grayville	1,918				
Greenfield	1,085				
		$480			$240
Greenup	1,085		Addison	591	
Greenview	1,019		Albany	729	
Griggsville	1,401		Alexis	915	
Grossdale	1,111		Algonquin	550	
Hamilton	1,344		Alt ny	633	
Hawthorne	1,000		Alto Pass	518	
Henry	1,037		Antioch	522	
Herrin	1,559		Apple River	576	
Highland	1,970		Argenta	525	
Hillsboro	1,937		Arthur	858	
Homer	1,080		Ashley	953	
Jonesboro	1,130		Ashton	756	
Kangley	1,004		Atkinson	762	
Kansas	1,049		Atwood	698	
Kelthsburg	1,566		Ava	984	
Kirkwood	1,008		Avon	809	
Kinmundy	1,221		Beechwood	854	
Knoxville	1,857		Bellmont	624	
Lacon	1,601		Bethany	873	
Ladd	1,324		Blandinsville	995	
Lahaipe	1,591		Bluemond	714	
Lanark	1,316		Bluffs	539	
		$863			$400
Lawrenceville	1,300		Bourbonnaise	595	
Lebanon	1,862		Bowen	528	
Lena	1,252		Bradford	773	
LeRoy	1,629		Brighton	660	
Lexington	1,415		Brimfield	677	
McHenry	1,013		Brocton	613	
McLeansboro	1,758		Brooklyn	865	
Madison	1,979		Brookport	865	
Marissa	1,080		Buda	873	
Maroa	1,213		Buffalo	531	
Martinsville	1,000		Bureau	545	
Mason City	1,890		Cabery	538	
Milford	1,077		Cable	697	
Millstadt	1,172		Capron	502	
Monticello	1,982	$2,375	Catlin	697	$1,150
Mount Carroll	1,965	975	Central City	615	487
Mount Morris	1,048	480	Chadwick	505	240
Mount Pulaski	1,643	863	Chandlerville	940	400
Mount Sterling	1,960	57	Chapin	514	33
Moweaqua	1,478		Chatham	629	

Over 500, under 1,000

TOWNS		Proposed Plant	TOWNS		Proposed Plant
Name	Pop.	Acc't	Name	Pop.	Acc't
Chebansee	555		Morton Grove	564	
Cissna Park	623		Mulberry Grove	632	
Clarke City	621	30	Nebo	508	30
Clay City	907	70	New Athens	856	70
Christman	905	15	New Baden	510	15
Clayton	996	10	Neponset	516	10
Clifton	652	½m.	New Berlin	533	½m.
Coffeen	963		New Boston	703	
Cornell	521		Niantic	654	
Coulterville	650	100	Niles	514	100
Cowden	751		Niles Center	529	
Creal Springs	940	.....	Noble	597	.....
Crete	760		Norris City	868	
Crossville	523		North Alton	904	
Crystal Lake	950		North Aurora	500	
Dallas City	970		Nunda	604	
Dawson	574		Oblong	743	
Danvers	607		Okawville	544	
DeSoto	560		Omaha	569	
Diamond	672		Oneida	785	
Dongola	671		Orion	584	
Durand	571		Oswego	615	
East Galesburg	663		Palestine	979	
East Peoria	899		Palmyra	813	
Elburn	606		Patoka	640	
Elizabeth	659		Pawnee	595	
Elizabeth Town	663		Pawpaw	765	
Elkhart	553		Pearl	722	
Enfield	971		Pelonia	865	
Equality	978		Percy	660	
Erie	768		Perry	642	
Evansville	663		Philo	502	
Fairmont	928		Piper City	577	
Fairview	501		Plainfield	920	
Farina	693		Pleasant Plains	575	
Fisher	614		Plymouth	854	
Flanagan	509		Port Byron	732	
Forrest	952		Potomac	764	
Franklin	687		Prairie City	818	
Franklin Grove	681		Princeville	735	
Gages Lake	642		Ramsey	747	
Georgetown	988		Randall	663	
Germantown	665		Rankin	754	
Gifford	700		Raymond	906	
Gillespie	873		Richmond	576	
Glen Ellyn	793		Ridgefarm	933	
Golden	516		Ridgway	839	
Grafton	988		Riverdale	558	
		$6,090			$6,030
Grand Tower	881		Roanoake	966	
Grape Creek	610		Rockbridge	588	
Gridley	716		Rockton	936	
Gross Point	669		Rutland	893	
Hampshire	760		Saybrook	879	
Hanover	785		Schaumberg	575	
Hennepin	523		Seatonville	909	
Hebron	611		Shabbona	706	
Heyworth	683		Shannon	678	
Highwood	750		Sherrard	826	
Hinckley	587		Sidell	776	
Hopedale	600	61	Sidney	564	61
Hume	598		Somonauk	630	
Huntley	606		South Danville	868	
Hutsonville	743		South Elgin	515	
Illopolis	744		South Holland	766	
Ipava	749		So. Wilmington	711	
		$240			$240
Irving	675		St. Francisville	591	
Johnston City	787		St. Joseph	637	
Johnstown	787		Stanford	601	
Kane	588		Steeleville	562	
Kenney	584		Steeger	712	
Kingston	509		Stewardson	677	
Kingston Mines	508		Stockton	946	
Kirkland	636		Stronghurst	762	
LaGrange Park	730		Summit	547	
Lake Creek	787		Swansea	735	
Lamoille	576		Tallula	639	
Lansing	830		Tamoroa	853	
Leaf River	507		Tampico	807	
Leland	634		Thornton	600	
Libertyville	864		Tiskilwa	965	
Loda	668		Toledo	818	
Lombard	590		Tolono	845	
London Mills	528		Towerhill	615	
Louisville	648		Tremont	768	
Lovington	815		Versailles	524	
Lyons	915		Villaridge	500	
McLean	532		Viola	552	
		$400			$400
Mackinaw	859		Walnut	791	
Macon	705		Warrensburg	503	
Mahomet	515		Washburn	703	
Makanda	528		Wataga	545	
Malta	507		Wayne City	522	
Manito	561		Waynesville	528	
Mansfield	708		Weldon	536	
Manteno	932		Western Springs	662	
Marine	666		Westfield	820	
Marysville	764		West Freeport	724	
Melvin	550		West Salem	700	
Mendon	627		West Spridgfield	668	
Meredosia	700		Westville	605	
Metamora	758	$1,150	Williamsville	573	
Milan	719	487	Windsor	866	$1,150
Milledgeville	633	240	Woodhull	774	487
Millshoals	669	400	Worden	544	240
Minier	746	23	Wyanet	902	400
Morriconville	934		Xenia	800	23
Morton	894		Yates City	650	
			Yorkville	840	179,552

To the Managers and Owners of Independent Telephone Companies in Illinois:

The Rogers Telephone Company for Iowa has made arrangements with Ed Hurmence of the Sumner Telephone Company, with J. H. Shoemaker and Paul Patton of the U. S. Telephone Company, with Vic H. Stevens of the Standard Telephone Company and of the Interstate Telephone Company, whereby these companies will traffic in the toll or long distance business, and will also deal in a standard way with the farmer companies.

We will finally charge the lines with my dynamotor current on terms which are accepted by these parties and then operate the new current in the local plants.

See new map in this issue of Telephony for territory covered by the combination.

In this way each company, including the farmer companies, *retains its individuality and yet all face the enemy for the long distance work.*

The Rogers Telephone Company for Illinois has been incorporated and we are getting in some good men, and at the proper time we will deal with you in the way we are dealing with the Iowa Companies, if you wish it.

If you were going to select the Faller Automatic, the rates (operating with present battery current) would be $15 and $10 to insure 8% dividends.

If the Strowger, the rates would be only $18 and $12.

If the Manual, the rates would be at least $20 and $17.

Many are now getting ready to accept some automatic.

The Iowa Companies can now take their time to choose which one they shall have. In the meantime we will enable them to do business with present equipment.

Why should you not begin to understand us when we are able to get along with the Independent Companies where we are known and at home?

If we have converted Ed Hurmence, J. H. Shoemaker Paul Patton and Vic H. Stevens, and they are now our loyal friends, why should any honest Independent doubt our sincerity or our ability to do as we have declared?

Our inventions are sure and our first object is to help, not hurt, the real Independent interests. Your disbelief cannot change facts and you are not asked to believe until demonstration is, in some way, made to you. I sincerely believe that without the use of my inventions you will still be obliged to get together in the long distance business and finally have the automatic. Therefore, your disbelief or belief in me and my inventions is an extra matter to be settled upon its merits.

Oscar Wentworth Rogers.

West Union, Ia., Oct. 20, 1904.

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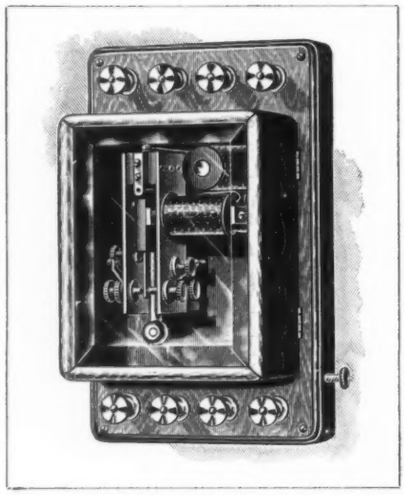

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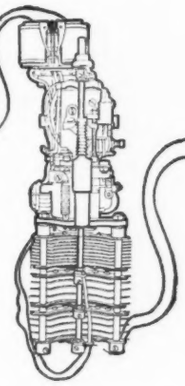

100 SUBSCRIBERS of the Citizens' Telephone Company of Grand Rapids, Michigan, were selected at random by a disinterested party and asked how they liked that company's AUTOMATIC TELEPHONE SERVICE in comparison with the manual service, which it replaced.

95 OF THEM said it was so perfect that there could be no comparison, they greatly preferred it;

4 OF THEM said they "didn't care which they had";

1 OF THEM preferred the manual service.

The above percentages indicate the attitude of 6,000 subscribers to Automatic Telephone Service in Grand Rapids.

MR. TELEPHONE MANAGER, if you are trying to satisfy the public and give your patrons the sort of service they appreciate most you will take the hint that this conveys and give them Automatic Service.

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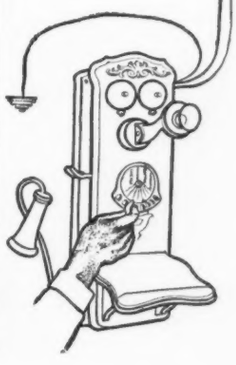
Dayton, Ohio	Los Angeles, Calif.	Woodstock, N. B.	Toronto Jct., Can.
Lincoln, Neb.	San Diego, Calif.	Westerly, R. I.	Wilmington, Del.
Portland, Maine	Hopkinsville, Ky.	Manchester, Iowa	Riverside, Calif.
Auburn, N. Y.	Sioux City, Iowa	Princeton, N. J.	Traverse City, Mich.
Lewiston, Maine	Cleburne, Texas	Albuquerque, N. M.	and Berlin, Germany
	Columbus, Ga.	Van Wert, Ohio	



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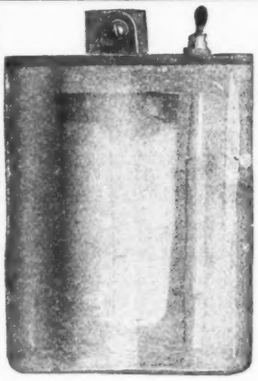

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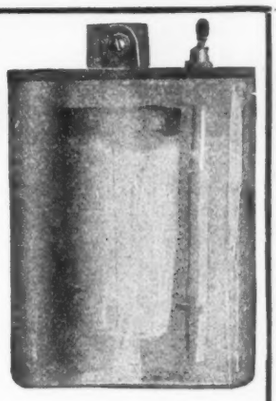

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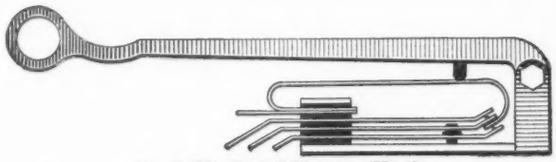

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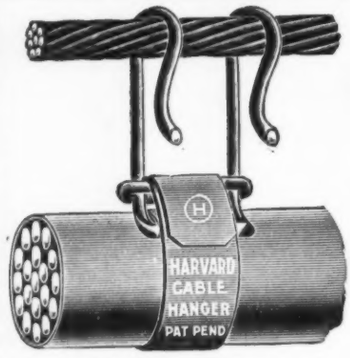

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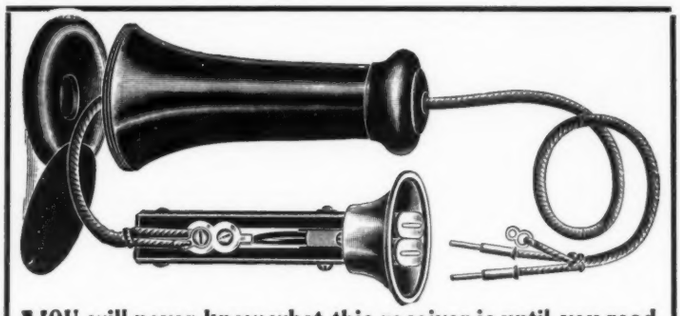

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Telephony.

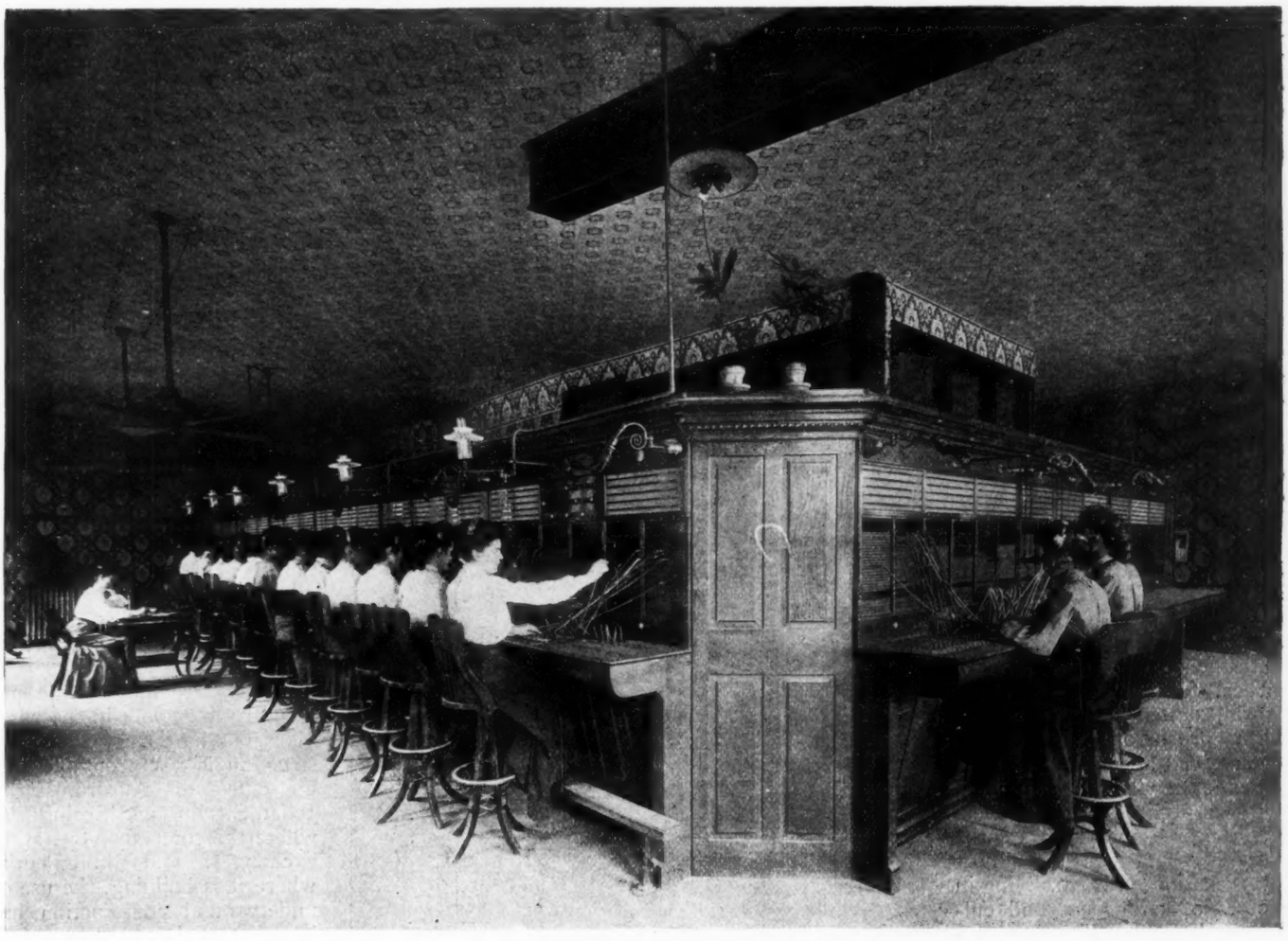
AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

VOL. VIII. CHICAGO, NOVEMBER, 1904. No. 5.

A Great Independent System

AMONG the prosperous and growing Independent telephone companies of the country there is none that has accomplished more for the cause in its territory, or won a greater share of success in proportion to the efforts it has expended, than the Inter-State Independent Telephone and Telegraph Company, the operating center of which is at Aurora, Illinois, where is situated also a branch office. The principal office is at Jersey City, New Jersey, while at Chicago is still another branch office.

The Inter-State Independent Telephone and Telegraph Company was incorporated under the laws of the state of New Jersey, November 7, 1901, to succeed The Northwestern Telephone Company, which was organized for the purpose of building and operating exchanges in the cities of Aurora, Elgin, Joliet and a few towns in Kane and Will

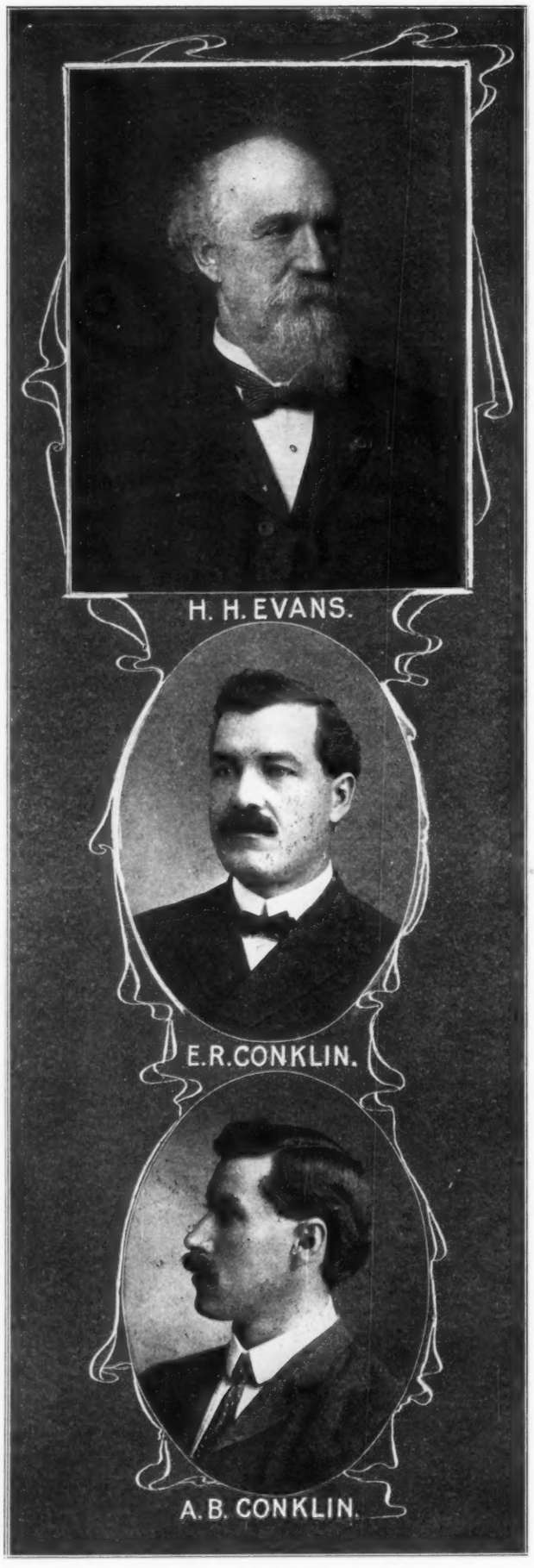


MAIN SWITCHBOARD OF THE JOLIET EXCHANGE, 1,800 LINES INSTALLED.

Illinois. Very early in the history of the Northwestern company, however, it became apparent that the capitalization was insufficient to meet the demands of the public in the territory above described and adjacent thereto, and that a reorganization must be made in such a way as would enable it to meet and supply these demands; for this purpose, the Inter-State Company was incorporated.

The operations of both companies having extended only over a period of three years will plainly evidence that its wonderful success is attributable first to its perfect organization; second, to its superior quality of construction and equipment, enabling it to surpass its competitors in the all-important matter of giving service; third, to the exceedingly favorable territory in which it operates, extending in a half circle around the great metropolis of the west, Chicago. This not only is a densely populated territory, but one of the most prosperous from a standpoint of diversified interests, as the towns have thrifty manufacturing industries, supported by as rich, if not the best, agricultural advantages covered by the same area of any in the United States. From this, extending out over nearly the entire state, with its network of toll lines, which connect it with other Independent companies by long-term contracts for the exclusive handling of their toll business, it successfully conducts business and is fast distancing its competitors.

The field chosen by the Inter-State company in which to construct and operate its telephone system has no superior in the world for the thrift and intelligence of its people. Embracing as it does the northern and central portions of the great prairie state of Illinois, and portions of adjacent states, with their broad expanse of the richest farming land in the world, dotted here and there with prosperous, well built commercial and manufacturing cities and villages, populated with a progressive and energetic people made up of the very best portions of almost every nation on earth, living in homes of refinement and culture where the daily paper regularly comes and is intelligently read, is it to be wondered at if the slogan of the Inter-State company of "A telephone for every home," should in a very short time become merely the expression of an accomplished truth, or is it to be wondered at if, in such a community, where merit, linked with opportunity, has won such a signal victory among its people, that a company such as the Inter-State, whose watchword is merit and efficiency of service, should be the popular medium chosen by the people for the accomplishment of that end?

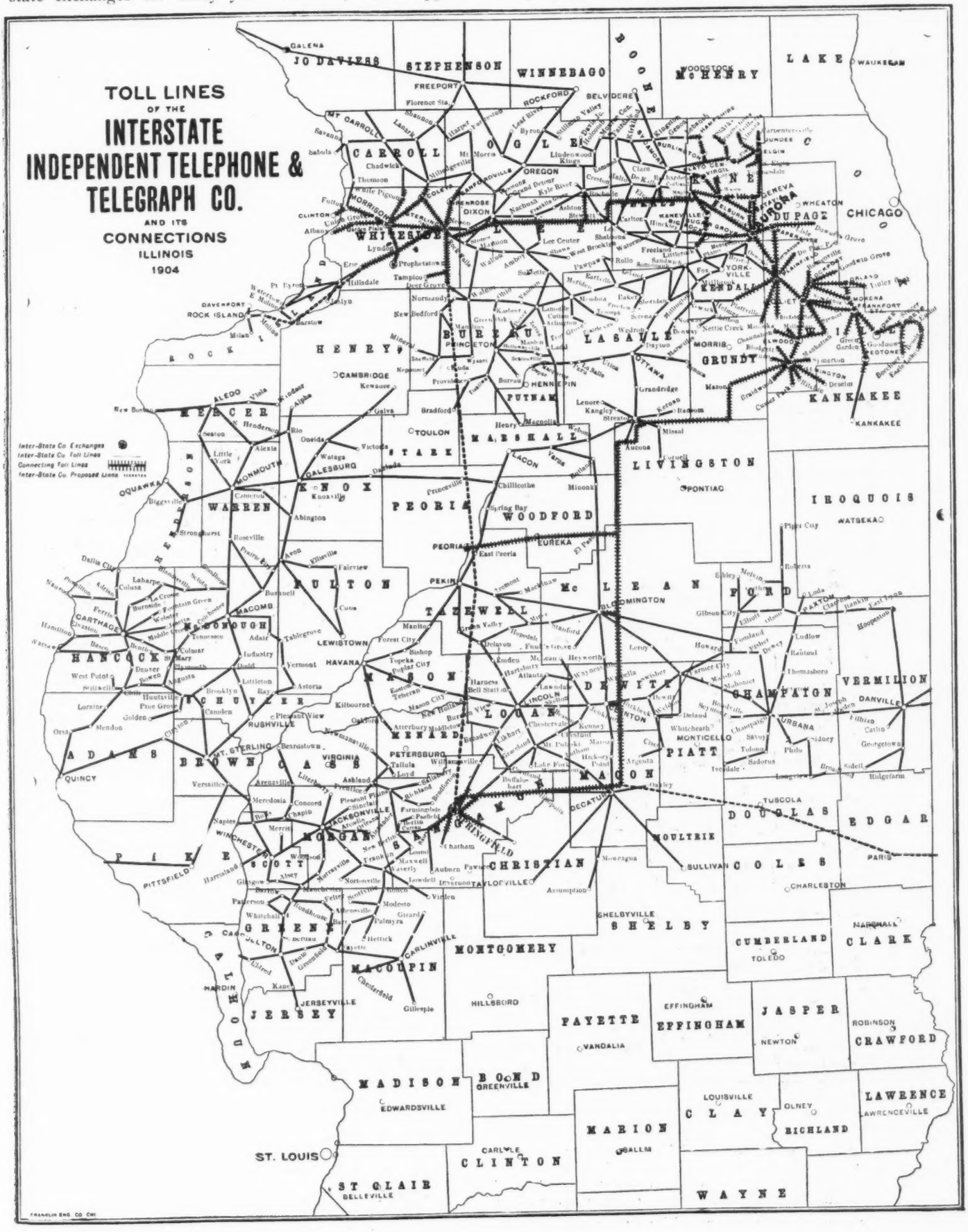


OFFICERS OF THE INTERSTATE COMPANY.

In aiming to supply a successful and desirable telephone service, its purpose has been to place itself in an impregnable position about Chicago, insuring to its patrons a high grade of local service in the thirty-six different exchanges which it operates. In addition to these advantages, it has traffic agreements practically completed with the Kinloch Long Distance Telephone Company of St. Louis for the handling of its business north of Springfield, and its service is desired by the Illinois Telephone and Telegraph Company, which is now installing an Independent exchange in Chicago. This secures for the company the connecting link between the two most important cities in the west, placing the Inter-State Company in the position of a common carrier of toll business between these two large cities, and the distribution of business in the territory occupied by Inter-State toll connections is generally acknowledged to be the most profitable of any branch of the telephone business.

In the building of exchanges no pains or money has been spared to make the construction the most durable and efficient that the art of telephony affords. The lines in the cities and villages are full copper, individual metallic circuits, the company resorting to the use of party lines only in the rural districts where single line construction is not profitable. In the cities of Aurora, Elgin, Joliet, Sterling and Springfield, where the company's operating exchanges, and in Peoria, where it is building, the use of underground construction has been resorted to on a very extensive scale, aggregating 157,-

425 feet of subway trench and 843,969 feet of ducts. This capacity has been installed to meet the growth of interstate exchanges for many years to come, which applies also to switchboard capacity and other items, involving the giving of future telephone service, as shown by the company's last property statement, assuring it of the opportunity to



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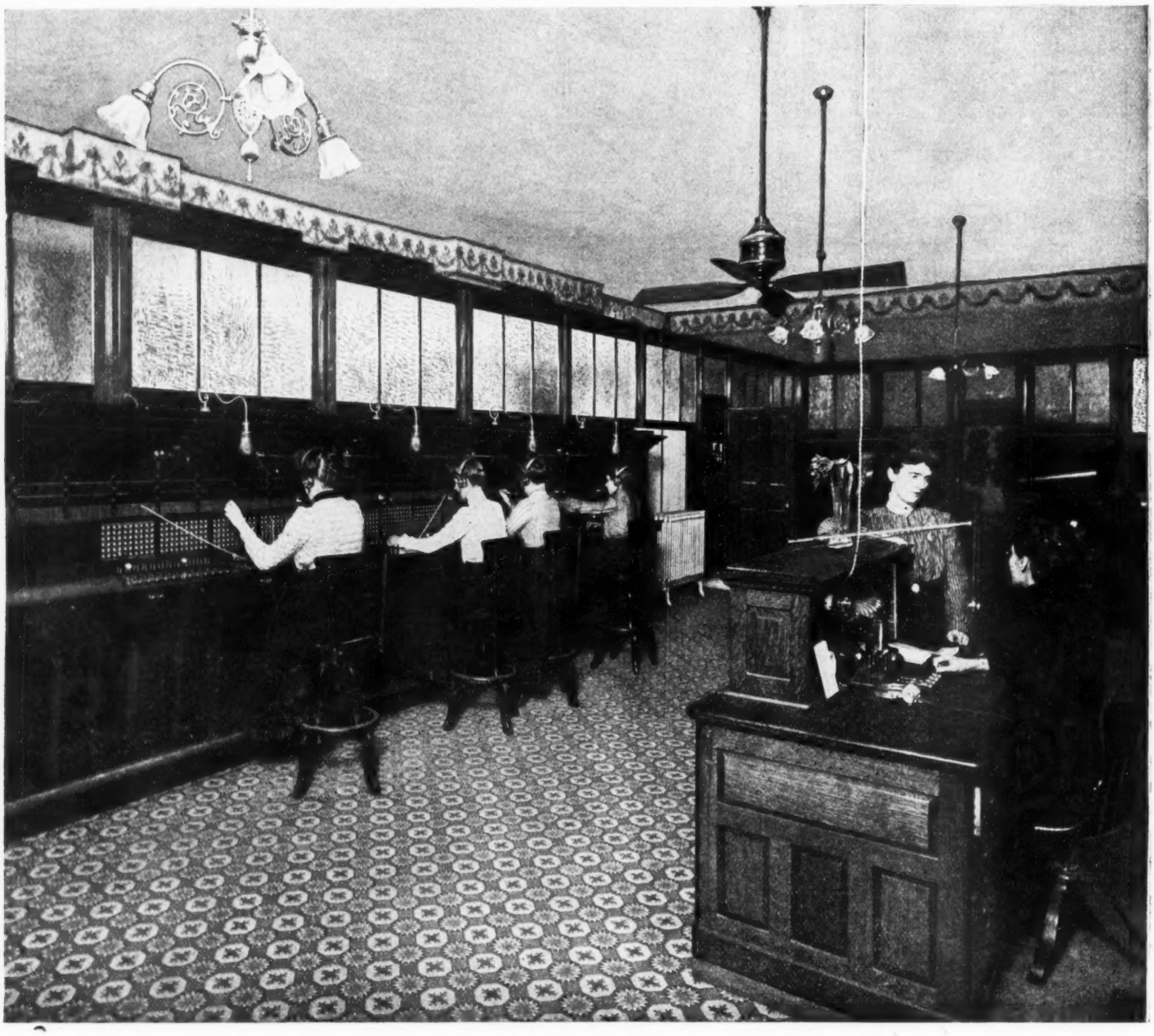
largely increase its earnings on the present investment, which is now very flattering when it is considered that the company is only able in this early stage of its development to utilize a small per cent of its installed capacity.

For illustration: In the cable capacity already installed, the company is using at the present time not less than 60 per cent, and the amount of latent property installed ready for use in all parts will average about 40 per cent, with the exception of conduit capacity in which it is not using at the present an average of one-third of the installed capacity. The equipment used has been uniform throughout, the company having adopted exclusively the telephones and switchboards of the Stromberg-Carlson Telephone Manufacturing Company of Chicago.

The Inter-State's rates for exchange service have been placed slightly below that of its competitor, sufficient to make the price attractive and yield a good income on the investment. From this standpoint, its advantage over its competitor is very marked, for the reason that the inception in the Independent movement found the Bell people with a very large investment, represented by a very inferior quality of equipment, requiring them, in order to retain a position in the telephone field, to add heavily to their investment and practically rebuild their entire plants in the Inter-State's territory. As an illustration: In the cities of Aurora, Elgin and Joliet, in order to compete with the Inter-State in quality of service, the additional new investments of the Bell have been fully equal to the total amount of the Independent company up to this time.

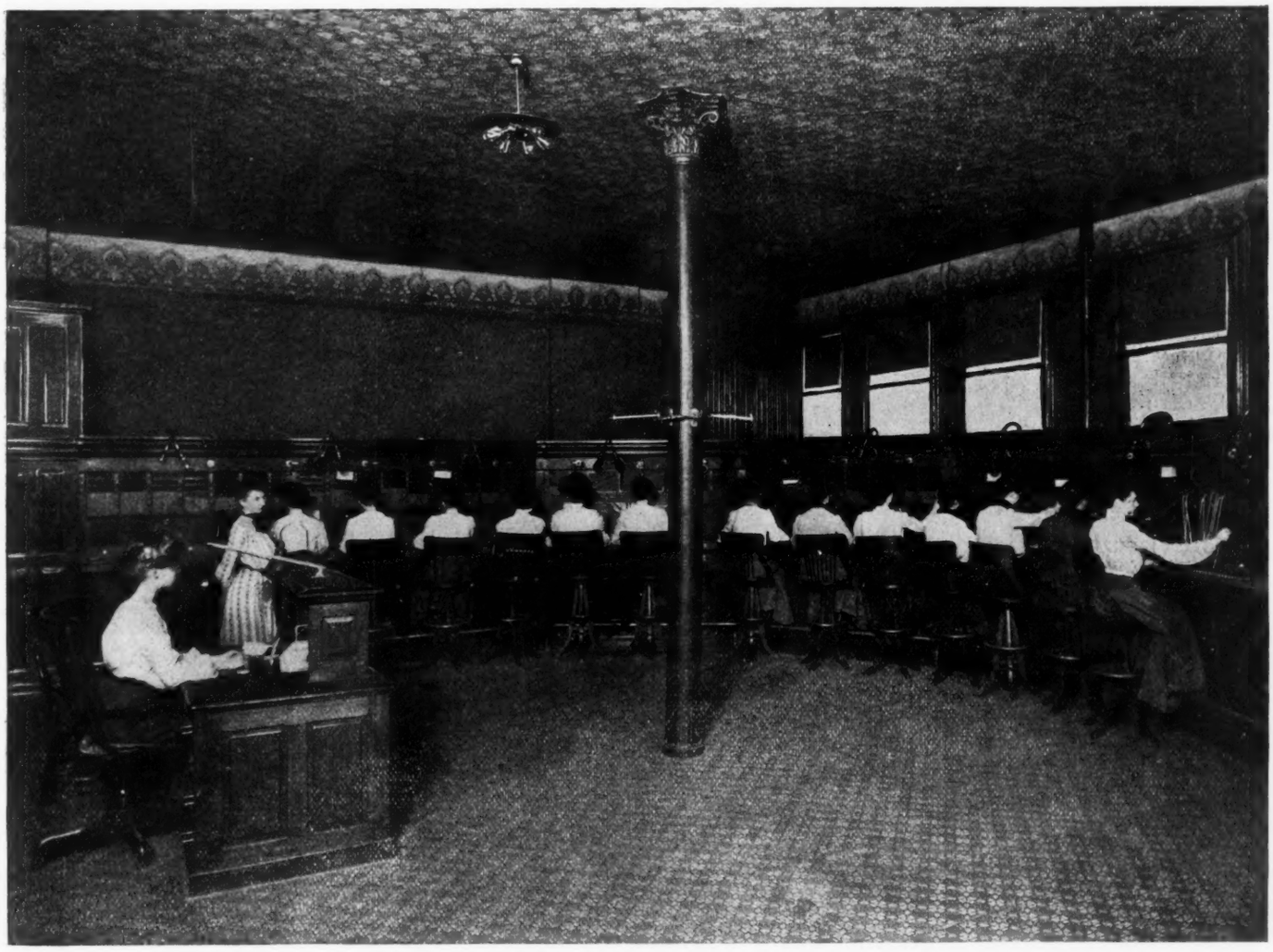
With this large increase of fixed charges to satisfy, the Bell company has resorted to party lines service and a slightly higher price for individual service such as the Inter-State is giving, with no material reduction in the charge for long-distance service over the excessive prices they charged before competition prevailed. This has enabled the Inter-State, as shown by the following list of charges for service in the various towns where it is operating, to make its prices attractive and exceedingly profitable:



MAIN SWITCHBOARD OF THE ELGIN EXCHANGE, 735 LINES INSTALLED.

	Business.	Residence.	Exch. Rent.
Elgin	$30.00	$18.00	$40.00
Batavia	24.00	12.00	10.00
Big Rock	24.00	12.00	*
Elburn	24.00	12.00	5.00

Geneva	24.00	12.00	6.00
Kaneville	24.00	12.00	*
Sugar Grove	24.00	12.00	*
Virgil	24.00	12.00	*
Joliet	30.00	18.00	35.00
Lockport	24.00	12.00	5.00
Plainfield	24.00	12.00	5.00
Elwood	24.00	12.00	5.00
Frankfort Station	24.00	12.00	*
Mokena	24.00	12.00	*



MAIN SWITCHBOARD OF THE AURORA EXCHANGE, 1,700 LINES INSTALLED.

Monee	24.00	12.00	3.00
Orland	24.00	12.00	4.00
Peotone	24.00	12.00	6.00
Wilmington	24.00	12.00	6.00
Naperville	24.00	12.00	6.00
Sterling	30.00	18.00	25.00
Morrison	30.00	18.00	10.00
Garden Plain	30.00	18.00	*
Erie	30.00	18.00	*
Penrose	30.00	18.00	*
Tampico	30.00	18.00	*
Deer Grove	15.00	....	*
Prophetstown	30.00	18.00	*
Plato Center	24.00	12.00	....
Coleta	30.00	18.00	*
Springfield	40.00	24.00	58.00
Peoria	40.00	24.00	Owns property
Aurora	30.00	18.00	35.00
Hampshire	24.00	12.00	5.00
Burlington	24.00	12.00	*
Dundee	24.00	12.00	6.00

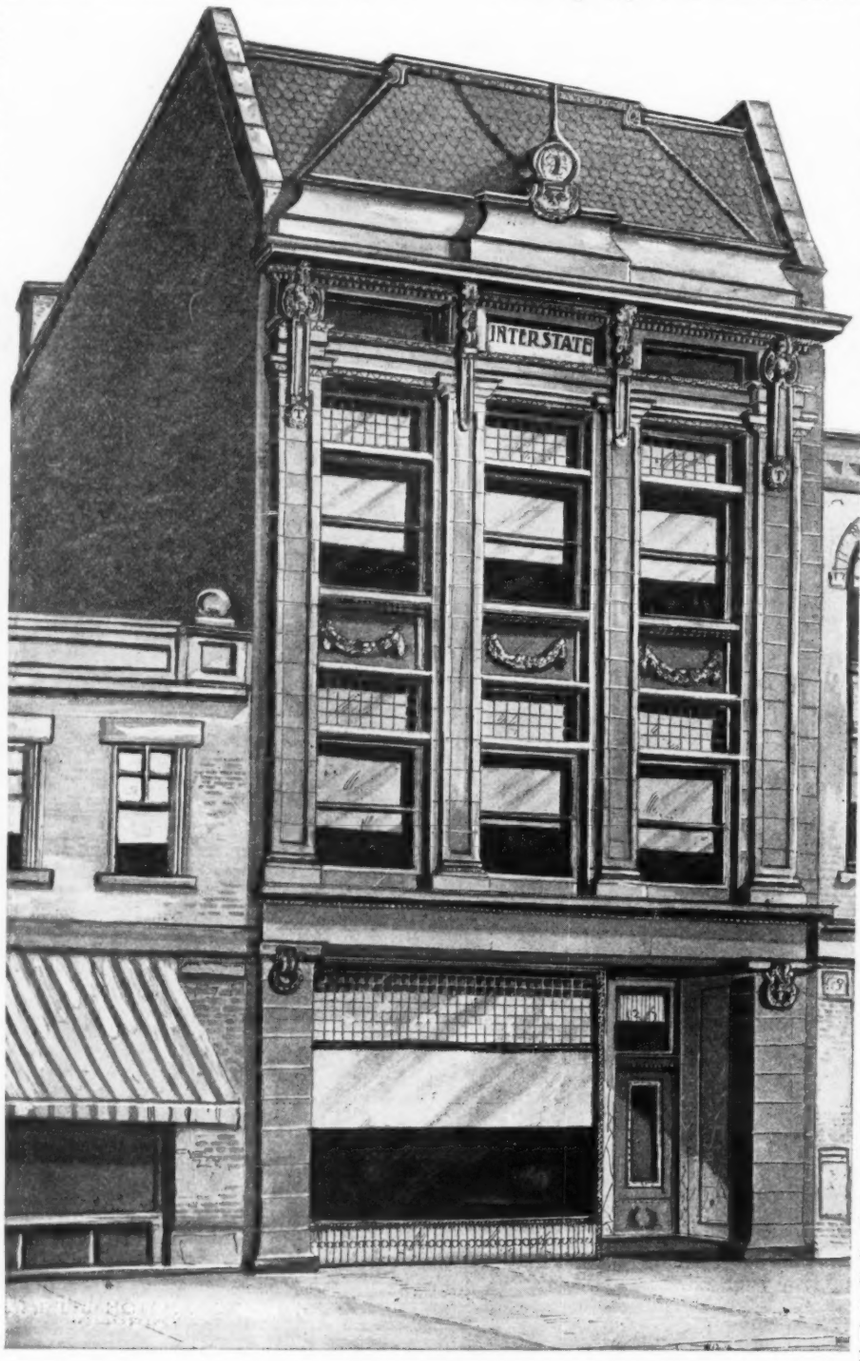
*Operated on commission basis not to exceed $3 per telephone, which includes the furnishing of operators, collectors and trouble men.

Beside its thirty-six exchanges the Inter-State company already has over 900 miles of trunk, copper toll lines extending west to Clinton, Iowa, connecting there with companies operating throughout that state, in addition to the intermediate points it reaches along the line. A copper trunk line is in operation as far south as Bloomington, Illinois, which will be completed to Springfield and Peoria; also a copper trunk line which is partially completed between Sterling and Peoria, both of which will be completed in the early spring, making a direct north and south trunk line through the central part of the state, forming a connection with the northwest and central part to Peoria and the capital city. This description would be incomplete without taking into consideration the proposed plans for connection with the toll line systems of the adjoining states, i. e., Indiana, Iowa, Missouri and Wisconsin, as well as the great metropolis, Chicago.

The following property statement of the Inter-State company made on December 31, 1903, tells its own story:

Total switchboard capacity	18,385
Total switchboard equipped complete	11,819
Total feet of subway trench	107,378
Total feet of subway ducts	588,706
Total number of manholes complete	367
Total feet of cable installed complete	782,288
Total number of telephones installed complete	10,000
Total number of miles exchange poles set and equipped	1,748
Total number of miles of open wire to connect exchange telephones	10,714
Total miles toll line poles set and equipped	797
Total number of miles of toll line wire	2,215

The total authorized capital stock of the Inter-State company is $3,000,000; the total authorized bonded indebtedness is $50,000,000. The stock is all common and it is stipulated in the trust deed securing the bonds that dividends shall be paid on the stock only out of the net earnings of the company. The bonds of the Northwestern Telephone Company of $500,000, of which $407,000 have been authenticated, were assumed by the Inter-State and retired by the issuance of its own bonds in lieu thereof; the bonds of the Northwestern, when surrendered to the trustee, are to be held as collateral security for the payment of the bonds of the Inter-State until all are surrendered, when they will all be destroyed. The stock of the Northwestern to the amount of $500,000 will likewise be retired and the stock of the Inter-State issued in lieu thereof. The bonds of the Inter-State company are dated January 1, 1902, and are due January 2, 1927. The American Trust and Savings Bank of Chicago is trustee in the deed of trust securing the bonds. The bonds do not become valid securities until authenticated by the trustee, and the trustee can authenticate them only upon satisfactory proof of property actually acquired. The trust deed provides for the creation of a sinking fund of twelve and one-half per cent of the net earnings of the company for the redemption of its bonds, and that the moneys from said sinking fund may be used for the retiring of said bonds at the option of the company at 105.



HOME OF THE PEORIA EXCHANGE.

In the operation of its exchanges the prestige and advantage given Inter-State business through the local stockholder, has resulted in this company obtaining the very best results from its employes, and in matters involving the economy in maintenance and extension of the business the ever watchful eye, which in many instances is the local banker, a directly interested party, has secured for it valuable opinions as to the best methods to adopt, such as its competitor could not obtain, for the reason that a corporation cannot afford to maintain at its various small exchanges management with sufficient judgment and experience to secure the results that the less expensive men, which the Inter-State is employing, can with the aid of local interests. The several exchange headquarters of the company have been secured for terms ranging from five to forty years at exceedingly low rentals, as shown by the above list.

It is the policy of the Inter-State company to so construct its telephone lines and exchanges as will best secure satisfactory service, permanence, durability, and minimum cost of operation and maintenance. The result is that the subscribers of the Inter-State company receive as good service as can be had anywhere. The price is uniform and reasonable. It is therefore, little wonder that the public has so quickly and emphatically recognized the merits of the company and is making such demands upon it.

It will be seen that with these advantages, together with the company's extensive underground system and substantial pole lines equipped with large capacities of high grade cables, the company's expense of operating is reduced to the lowest possible figure that can be shown by a practically constructed and vigilantly guarded telephone system. The organization and bond issue of the company have been submitted to and approved by some of the most prominent and well-known corporation attorneys in Chicago, and its trust deed and securities have been prepared to meet the requirements of New York Stock Exchange, which permits of them being listed on any stock exchange in the world.

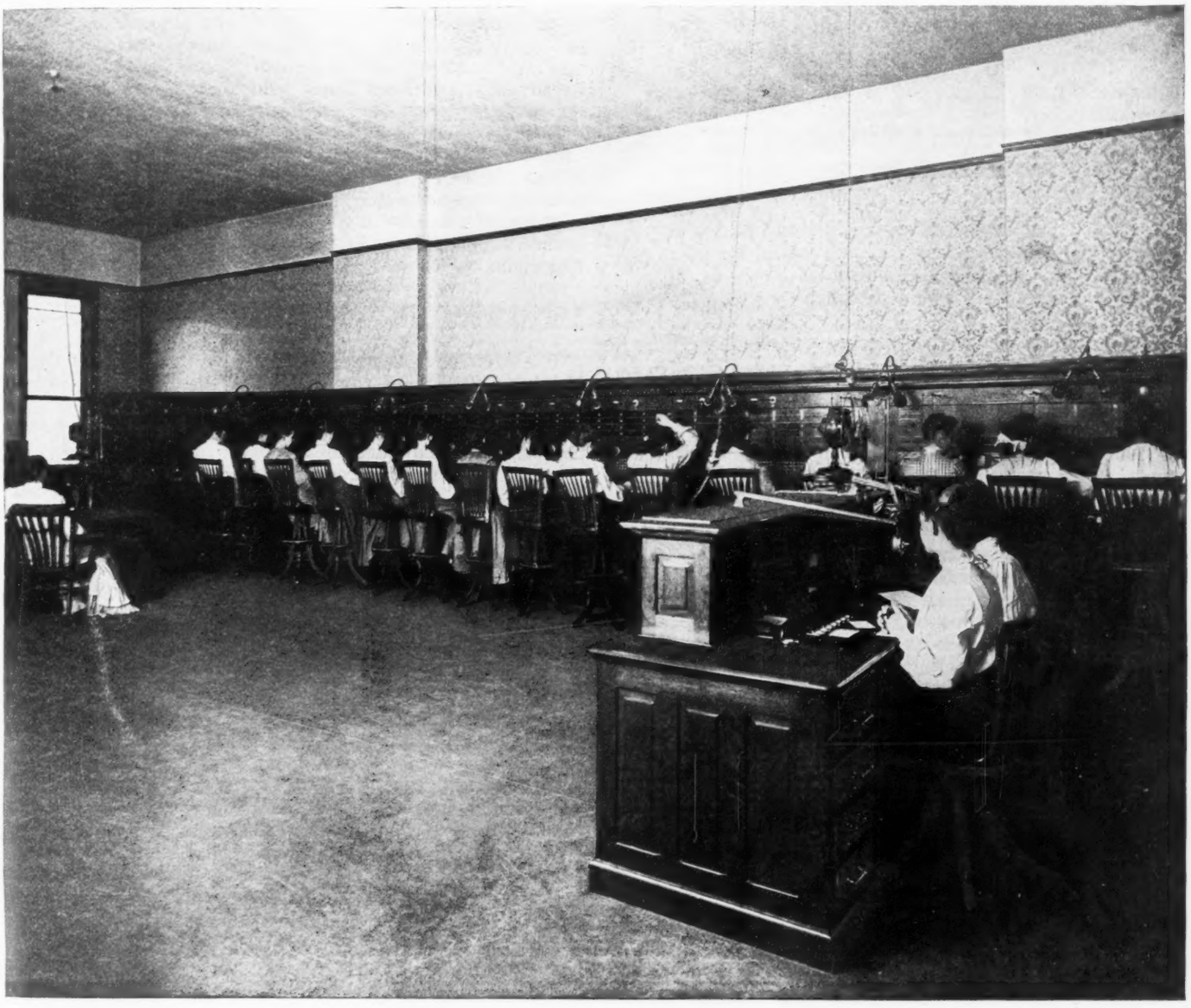
The Inter-State bonds are a first mortgage five per cent collateral trust gold bond, secured by a mortgage on all its property, both real and personal, with interest payable semi-annually, in April and October. In the issuing of securities the plan prevailing in a large per cent of industrial or public utility corporations—that of giving to a construction or pro-

moting company a large profit for the organizing and building—has been entirely eliminated by the Inter-State company, and its bonds are only issued as required by its trust deed in amounts equal to that of cash actually expended in the construction of property, which must be shown and sworn to before the trustee, in order to secure the authentication of bonds.

The Inter-State company has been able, with all its latent property, to pay all fixed charges and operating expenses, beside thirteen quarterly dividends of one per cent each on its issued capital stock, and has a good surplus left. The securities of this company are held largely by bankers and men looking for a permanent investment, which has resulted in so small an amount of securities being available for sale as to preclude the advisabilities of listing them until an expression from a larger per cent of security holders has been obtained than there has up to this time.

The following table showing the gradual development of the Inter-State Independent Telephone and Telegraph Company, and its predecessor, The Northwestern Telephone Company, reveals in a concise form the material facts as to its financial condition and the bonds on which interest is computed, the stock indicated being the bonds and stock represented in the investment from which the income was, from time to time, realized:

	1901. Jan. to July.	1901. July to Dec. 31.	1902. Jan. to July.
Number of telephones	1,286	2,809	4,327
Gross receipts	$10,104.88	$21,920.37	$38,786.53
Operat'g & mainten'ce	4,345.90	8,987.41	14,847.22
Net receipts	5,758.98	12,932.96	23,939.31
Bond interest	3,375.00	5,875.00	11,375.00
Surplus	2,383.98	7,057.96	12,564.31
Stock issued	150,000.00	285,000.00	500,000.00



MAIN SWITCHBOARD OF THE SPRINGFIELD EXCHANGE, 1,750 LINES INSTALLED.

	1902. July to Dec.31.	1903. Jan. to July.	1903. July to Dec. 31.
Number of telephones.	6,519	9,242	10,000
Gross receipts	$59,023.87	$69,582.07	$80,836.76
Operat'g & mainten'ce	23,587.52	30,274.76	38,769.96
Net receipts	35,436.35	39,307.31	42,066.80
Bond interest	13,650.00	16,955.06	18,195.37
Surplus	21,786.35	22,352.25	23,871.43
Stock issued	685,800.00	768,300.00	969,915.00

The Inter-State company, having a carefully organized corporation, a thoroughly constructed, economically and systematically managed property, occupying a favorable territory, and commanding the important connecting link between great financial centers, dispensing a popular commodity, already has attained to a position of success, thrift

and prosperity; and it may be regarded as one of the most secure and permanent investments, as well as absolutely the highest standard of construction and equipment, to be found.

It may be truthfully said of the Inter-State company that "its lines have fallen in pleasant places." The unparalleled success of its predecessor and the rich legacy of public esteem left it by the Northwestern, together with its most efficient and conservative management, have placed it upon such a high plane of usefulness as to insure its unbounded success in the future. Following in the footsteps of its predecessor and making itself "of the people and for the people," the people have come to recognize their own, and are at this time simply overwhelming the management for its service—a service as good as can be had anywhere in the world.

The officers of the Inter-State Telephone and Telegraph Company are as follows:

President—Henry W. Evans.
Vice-President—Vine A. Watkins.
Secretary and General Manager—Edward R. Conklin.
Treasurer—Archie B. Conklin.
General Counsel—Mazzini Slusser.
General Attorney—Joseph B. Stephens.

Directors—Henry H. Evans, E. R. Conklin, A. B. Conklin, W. T. Campbell, Charles B. Cheadle, J. F. Harral, E. J. Miller, Vine A. Watkins, C. F. Stotzer, E. J. Clapp, S. H. Case, Edward Dickinson, Chas. N. King, B. G. Richmond, H. D. Wagner.

HARMONIC TELEGRAPH

BY PROF. FERDINANDO LORI.

The interesting phenomena of electromagnetic and electromechanical resonance in alternating-current circuits are well-known. These phenomena, which chiefly depend upon frequency, take place when this factor reaches a certain value; and, therefore, this gives us a method of measuring frequency. If the e.m.f. acting on the circuit has a complex form resulting from the algebraic sum of several harmonics, each of them having a sinusoidal form, a method can be derived for ascertaining the existence of any given harmonic.

Let us assume a complex e.m.f. resulting from several harmonics, each of which can at will be included or excluded from a circuit at fixed time intervals. Then the resonance phenomena may be employed to determine when each harmonic is acting; and, if these time intervals follow a fixed law (like that of the Morse alphabet), we will be able to transmit simultaneously on the same line as many telegrams as we have harmonics at our disposal.

A multiple transmission system based on this principle has been devised and tried by the author. The results of the experiments I have thus far made in order to ascertain the practicability of the system have been so satisfactory as to induce me to beg the honor of briefly calling your attention to the matter.

The transmitting station includes several transformers, whose secondary circuits are all connected in series with each other and with the line, while the primaries are separately supplied with alternating e.m.f., as nearly as possible of sinusoidal form, quite independent of each other and of different frequencies. The currents can be generated by means of special alternators or by means of microphones excited by playing before their mouthpieces organ pipes of proper length. In the circuit of every e.m.f. a switch is inserted to be manipulated as an ordinary Morse key, to send the signals corresponding to that frequency. The receiving apparatus is also connected in series with each other and with the line in the receiving station.

Each receiving apparatus includes a wire stretched between the poles of a permanent magnet, the tension of which wire can be varied by means of a micrometer screw and regulated so as to make the vibrational period of the wire coincide with the frequency of one of the generators. Under such conditions, and when the e.m.f. of the generator is acting on the circuit, the wire vibrates; and if it is small enough, no sensible disturbance by phenomena from inertia takes place, the vibrations practically beginning with and being simultaneous with the action of the e.m.f.

Perpendicularly to the vibrating wire is placed a thin and rigid rod (for instance a small glass tube); one extremity of the rod is fixed and a point of it is connected with the vibrating wire. Consequently, when the wire vibrates the rod also comes into vibration, and the free extremity can be employed to write its own oscillations on a recording cylinder, after the manner of a recording tuning fork. The receiving apparatus is sensible to very small currents, under 1/20,000 of an ampere. The vibrating wire is of phosphor bronze, about 20 cm. in length, with a diameter of about 1/20 mm.

Paper read at the International Electrical Congress at St. Louis.

TELEPHONE INSTALLATION ON "MINNESOTA."

The Minnesota, a steamship recently built for the Great Northern Steamship Company, has the largest telephone system ever placed on board a vessel. As a matter of fact there are two distinct installations, one a general exchange permitting of communication between the various parts of the ship, and the other connecting the various executive offices.

Besides the instruments in the state-rooms, telephones are installed in almost every part of the vessel, such as the captain's private state-room, the ladies' drawing-room, the smoking-room, library, kitchen, pantry, steward's department, laundry, chief engineer's office, and chief electrician's offce, so that no matter what a passenger's wants may be, he can be connected with the department desired. The instruments are set flush with the walls, and are finished in black.

The intercommunicating system is distinct from the general system and consists of eleven stations, as follows: The forward navigating bridge, main navigating bridge, after navigating bridge, port and starboard engine rooms, crow's nest, pilot house, chief engineer's office, chief electrician's room, central electric lighting station, and dynamo shelf. Of these the first five are water-tight marine type instruments. This construction is necessary on account of their exposed position to moisture and dampness.

TELEPHONES IN POCKETS.

Pocket telephones used for evading the anti-gambling laws of New York city were captured for the first time, the police say, in a raid which Inspector Walsh, Captain Hussey and ten subordinates recently made on an alleged pool room in West Forty-seventh street, when they arrested six men. The telephones were ingenious contrivances by which connections could be made or broken in a few seconds and which could be carried in the pockets of the owners without fear of detection. A reasonably dexterous man could rid himself of one on the way to a police station, under the eyes of a bluecoat. The tiny instruments, each a transmitter and receiver in one, were used to get around the inconvenience of running pool rooms without the use of telephones.

A good operator, like a good woman, is a pearl beyond all price.

Conventions of Independents

PENNSYLVANIA STATE INDEPENDENT TELEPHONE ASSOCIATION.

AT HARRISBURG, Pennsylvania, on September 27 and 28, was held a largely attended and enthusiastic meeting of Keystone state Independents, which resulted in the formation of the Pennsylvania State Independent Telephone Association as an auxiliary to the new national association. The convention was successful in every sense of the word and productive of results far beyond the most sanguine hopes of the promoters.

On September 8 there was a gathering in Philadelphia of prominent Independent telephone operators from different parts of the state, at which it was decided to call a convention at Harrisburg. The prime movers in the affair, all of whom were present at the meeting, were: C. E. Wilson, Philadelphia, general manager of the Keystone Telephone Company and president of the Keystone State Telephone Company; J. G. Splane, Pittsburg, president of the Pittsburg & Allegheny Telephone Company; Hon. R. E. Umbel, Uniontown, president of the Maryland, Pennsylvania & West Virginia Telephone and Telegraph Company; W. D. Barnard, vice-president of the United Telephone and Telegraph Company; E. D. Schade, Johnstown, secretary of the Johnstown Telephone Company; Senator C. W. Kline, Hazleton, president of the Consolidated Telephone Company of Pennsylvania; William B. Trask, Erie, president of the Mutual Telephone Company of Erie; George B. Rudy, York, general manager of the York Telephone Company; H. E. Bradley, Philadelphia, superintendent of the Eastern Traffic Association; Hon. B. F. Meyers of Harrisburg, president of the Cumberland Valley Telephone Company.

The delegates upon their arrival in Harrisburg were taken in hand by the chairman of the reception committee, F. A Wunder of Philadelphia, who extended a most cordial greeting. The other members of the reception committee were: Willard P. Beardsley, Harrisburg, district superintendent of the United Telephone and Telegraph Company; W. H. Wilson, Erie, general manager of the Union Telephone and Telegraph Company; Cameron L. Baer, Harrisburg, manager of the local office of the United Telephone and Telegraph Company; W. H. Denlinger, Patton, president of the Huntingdon & Clearfield Telephone Company.

The first business of the convention was the meeting on Tuesday morning of the executive committee, presided over by W. D. Barnard of Philadelphia, at which the following committeemen were selected:

Nominations—Edward Davis, Philadelphia; A. F. Moses, York; E. D. Schade, Johnstown; John M. Core, Uniontown; S. G. Latta, St. Mary's.

By-Laws and Constitution—Robert E. Flinn, Pittsburg; J. P. Conley, Cresson; C. E. Wilson, Philadelphia.

Programme—F. D. Houck, Philadelphia; O. S. Marshall, Rural Valley; H. E. Bradley, Philadelphia.

Toasts—W. D. Barnard, Philadelphia; J. G. Splane, Pittsburg; C. E. Wilson, Philadelphia.

The announcement of the committees was deferred until the organization meeting in the evening, at which time they were ratified. The evening meeting convened at 8 o'clock, with all the delegates in attendance.

Mayor Vance C. McCormick, in a felicitous address, welcomed the telephone men to Pennsylvania's capital city and said that Harrisburg was proud to have the Independents within her gates, as they represented a sentiment that was freeing the people of the state from the grasp of telephone monopoly and stood for enterprise and progress. Better and cheaper telephone service, he said, had been secured for Harrisburg by the entrance of the Independent interests into that city. He was proud of the fact, he further asserted, that when the ordinance granting an Independent company a franchise in that city came up for consideration he supported it by word and deed, and helped to pass a measure that not alone resulted in a greatly improved and cheapened service, but added yearly a large sum to the city treasury of Harrisburg. Mayor McCormick predicted a brilliant future for the Independent movement in Pennsylvania.

The mayor's welcoming address was responded to by W. H. Denlinger of Clearfield, who thanked the city's executive for his words of cordial greeting, and assured him that all present appreciated the hospitable manner in which they had been received by Harrisburg. Mr. Denlinger took occasion also to state the objects of the association. He voiced the sentiment of the convention in his emphatic declaration that Independent telephony had "come to stay," and that the present benefits which it was bestowing upon the people of Pennsylvania and other states were but a taste of the great and good things which the future would develop.

James B. Hoge of Cleveland, president of the National Independent Telephone Association, extended greetings from the national body to the Pennsylvania association and said that the Keystone state enjoyed the distinction of holding the first convention to organize along the lines laid down at the St. Louis meeting. At some length he dwelt upon the proceedings of the gathering of Independents on the World's Fair grounds, which was listened to with rapt interest by the delegates. He also presented in detail the Ohio plan of organization, and enlarged upon the benefits to be derived from dividing a state into districts. There are two classes of membership in the Ohio association—active and associate. The first receives officers or directors of any Independent telephone company included in the scope set forth in the by-laws, the annual fee being $10. The second receives anyone connected with an Independent telephone company, the member paying an annual fee of $1 and having all privileges except the ballot. By special arrangements a subscription to TELEPHONY goes with each membership.

Another officer of the national organization who was present and who was called upon for an expression of views was Secretary A. L. Têtu, general manager of the Home Telephone Company, of Louisville, Kentucky. "Pennsylvania's lead in organizing on the plan set forth at St. Louis must be followed by the other states," said Col. Têtu. The establishment of practical working organizations in the several states, to co-operate with the national association, would, he said, aid greatly in the work of the national body and assist in making it a mighty power in the Independent movement.

The secretary of the meeting, H. E. Bradley of Philadelphia, superintendent of the Eastern Traffic Association, said that an important provision in the by-laws, which in the main are similar to those suggested at St. Louis, was that officers or employes of telephone lines operating in contiguous territory could become members of the Pennsylvania association. This extends the field and takes in, if desired, New York, New Jersey, Delaware, Maryland, Virginia or West Virginia. This provision was made in order

to help those states where it is thought the Independent lines are not sufficiently strong to maintain a separate state association at the start, but where the Independent operators are desirous of becoming identified with some working organization.

The following officers were elected:

President—B. F. Meyers, Harrisburg.

First Vice-President—R. E. Flinn, Pittsburg.

Second Vice-President—Charles Griffith, Johnstown.

Secretary—H. E. Bradley, Philadelphia.

Treasurer—C. E. Wilson, Philadelphia.

Executive Committee—B. F. Meyers, Harrisburg; C. W. Kline, Hazleton; C. E. Wilson, Philadelphia; J. G. Splane, Pittsburg; R. E. Umbel, Uniontown; W. D. Barnard, Philadelphia; E. D. Schade, Johnstown; William B. Trask, Erie, and G. B. Rudy, York.

National State Trustee—Ellis F. Orvis, Bellefonte.

"Telephone Auditing" was the title of a paper, which I. D. Gindhart, Jr., of Philadelphia, read before the convention. In substance it was as follows:

The auditing department of a telephone company is gradually becoming a very important one, and as business expands and the control of vested capital finds itself in hands more or less scrupulous and skilful a closer, more vigilant watchfulness upon the income and disbursements of corporations is required. This is the need of the day and has been met throughout the country by the formation of auditing companies and auditors in charge of their departments.

Auditing is a necessity. How much so depends on the management and size of the company. Railroads have long ago conceded that auditing and accounting went hand in hand with the operating departments and their auditors and statisticians to-day hold enviable positions, consulted by the presidents, general manager and board of directors.

The opinion is sometimes expressed that the cost of placing statistical information in the hands of the parties to whom such information is of value, is greater than is warranted by any benefit accruing. But the fact still remains that all large companies to-day find it profitable to spend thousands of dollars annually in the preparation of reports to show all details of the business and to place before the executive heads the cost of each department, that all leaks may be stopped.

Auditors agree that auditing is an art; that is, auditing in its broader sense, which includes all branches of accounting. Bevee tells us, the art of a thing is, first, its aim, and next, its manner of accomplishment. The aim of the auditing department is primarily a careful record of all income (crediting the respective sources) and all disbursements are charged in such a manner that the expense of the business may be easily determined.

Comparative records will often cause the dismissal of a careless and expensive district manager and prove that the industrious, conscientious manager is making things pay. A cost book showing itemized cost of construction will oftentimes show an unnecessary increase of cost of one line over another. A cost book is easily kept by having a cost number for each new undertaking and posting all material labor and proportion to general expense to the cost and closing the account when work is completed.

A daily report of stock receipts and disbursements is an excellent check upon storekeepers, and it is well that semi-annual inventories be made to adjust stock ledgers. Comparative reports of earnings per trunk line show when a line has exceeded the estimated carrying capacity or indicated if it is operating at a loss. Taking care of toll business was the bugaboo for a time and many were the methods of the settlements, but now it is an easy matter, as it is shifted upon the traffic association.

Every telephone corporation has its own method of auditing. These different methods are extremely annoying to the purchaser of bonds or stocks and oftentimes tend to confuse one's ideas of actual value of the properties.

We must look forward to the day when consolidation will take place and companies will be grouped together and *standardization* will be the keynote. To this end I suggest a telephone auditors' association for the purpose of standardizing the accounts, using a system elastic in its principles, applying to the small as well as the large.

Such an association for street railway accounting met in Boston in 1898 and the system adopted then is now in use in over 100 large street railway companies. A standard and uniform system of accounting is of much importance as the standardization of equipment and lines and the benefits accruing from it will be found to be as great.

Interesting addresses also were made by H. E. Bradley of Philadelphia, secretary of the association, Charles Russell of Philadelphia, and C. E. Wilson, general manager of the Keystone Telephone Company of Philadelphia, who spoke on "Bell Methods," and the points in whose address were practically the same as those in the paper which he prepared for the national convention and which is printed in full in this issue of TELEPHONY under the head, "Convention Papers."

Mr. Russell spoke on "Telephone Equipment." He pointed out that this subject is one which concerns every person who has any connection with the telephone business, either as a subscriber, a casual user, or those who are directly concerned in financing, operating or maintaining such equipment. The subscribers are interested to the extent that they desire to get the results of telephone service with as little effort as possible on their part, which is clearly demonstrated by the difficulties experienced by the traffic department. To those who are interested financially the equipment is of great importance from the fact that there is so much money piled into so small a space. Few men, who are not acquainted with an equipment in any other way than dollars and cents invested, and the interest obtained from the investment, can be persuaded to recognize the necessity for investing so much money for this part of a system. In a multiple board which provides for 5,000 subscriber lines there are about 85,000 jacks at a cost of about $150,000. The cost of equipment seldom runs less than this, but in large boards they cost many times more.

Mistakes occur in the maintenance, which are frequently due to the idea that the equipment does not require attention. This is very often the case with new companies that do not place their equipment in good hands until it has so deteriorated that it is practically beyond redemption. Such conditions are often followed with a case of telephone malaria, which can only be cured by a large dose of receivership, or some proceedings through which the originators lose their money. It is a fact, however, that few persons have regretted entering the telephone field, where good engineering, construction, operation and maintenance have been secured. There are three officials who must work together in harmony, viz., the engineer, who provides an equipment of the highest efficiency and is ever alert to secure for the public the very best transmission to and from all points, either local, toll or long distance; the superintendent of maintenance, whose duties are to keep the equipment in perfect working order, and the traffic manager, who handles the business for whom all others are providing a means for accomplishment.

The crowning feature of the convention was the banquet which was held in the auditorium of the Harrisburg Board of Trade building on Wednesday evening. Covers were laid for 300, and fully that number of delegates discussed the elaborate *menu* which had been prepared. The decorations, which were on an extensive scale, were unique as well as beautiful, being arranged with the idea of harmonizing with the spirit and purpose of the occasion. The general scheme of telephony brought out in the floral arrangements made a highly pleasing impression upon those present and came in for much favorable comment.

The toastmaster's table, a large, circular affair, was stationed directly in front of the stage. In the center of this was set an enlarged desk telephone set, done in smilax and flowers and lighted by vari-colored electric bulbs—a neat conception, skillfully worked out. Extending to either side of the hall at the left and right of the toastmaster's table were two large tables. Radiating from the center table along the flanking tables were complete sections of a telephone line in miniature. The poles were wound in moss and smilax, and the cross-arms, one to each eight poles, bore seven small incandescent electric lights, representing the insulators. These lights were pointed upward, the larger ends being frosted. The reflected light glistening from copper

wire, new coils having been taken from stock to heighten the artistic effect.

At the rear of the stage was suspended a shield bearing the Pennsylvania coat-of-arms, in front of which, entirely concealed by a bank of potted plants, among which sparkled myriad small green incandescent lights, was stationed the orchestra, which played during the time the banqueters were discussing the feast. All the prominences in the hall were covered with flowers, dahlias and carnations prevailing largely. The balcony railings were adorned in the national colors.

To Willard P. Beardsley of Harrisburg, district superintendent of the United Telephone and Telegraph Company, is due the main credit for devising and putting into effect this novel decorative scheme. He was given unlimited power in the matter by the executive committee and made the most of the opportunity. Mr. Beardsley was assisted in the work by a corps of men from the Harrisburg United office, superintended by Granville S. Herbert, wire chief.

Standing on the tables and in other convenient places were dozens of vases in which reposed clusters of fragrant, beautiful blooms, and at each place was placed a carnation boutonniere. Each guest received as a souvenir a miniature telephone receiver, one and one-quarter inches long, pendant from a ring for use as a watch charm. Miniature switchboard plugs of the same length were distributed also. The menu cards were of deep blue, cut in keystone shape, bearing a cut of a desk set, with the occasion and date upon the front cover.

Aside from the delegates who had been in attendance upon the two days' convention, there were present a number of Pennsylvania's prominent financiers, members of the bench, legal lights and politicians. Ex-Governor William B. Bunn of Philadelphia headed a large party from the "city of brotherly love," which arrived on a special car just previous to the banquet. John M. Mack of Philadelphia and W. R. Bliss of Chester were present also.

The telephone men sat down to the banquet at about 8:15 and it was 10:45 o'clock when President B. F. Meyers of Harrisburg, who officiated as toastmaster, introduced H. D. Critchfield, general counsel of the Automatic Electric Company of Chicago, as the first speaker. Mr. Critchfield made a breezy talk and among other things of interest he said: "No business is so absolutely certain of profit for the investor as the telephone. The business is not affected by hard times or any of those conditions which reduce the profits of other commercial enterprises, for always one of the last things to be dispensed with is the telephone. In order to keep his telephone a man will economize in almost any other direction—he will put up with one or two less radiators, or consume a little less coal, or burn a few less lights. But he cannot and, as a rule, will not do without his telephone, as he recognizes that it is a necessity as a money saver."

Col. C. C. Clements of Sunbury talked in a most interesting manner on the organization of Independent telephone companies.

Treasurer Hall of the Pittsburg & Allegheny lines made the emphatic assertion that the paying qualities of the Independent lines is a business which has proven its ability to pay from 3½ to 5½ per cent interest. Wipe out the Independent telephones of the country to-day, Mr. Hall said, and the business machinery would stop. The Bell lines could not begin to handle the trade.

Col. A. L. Têtu of Louisville, Kentucky, made one of his characteristic postprandial addresses, dwelling in the main upon existing conditions in Louisville. He said that for two years the Independents have been in that city. When the exchange of which he is general manager was established there the number of telephones in the city was 2,000; now there are 14,000, the Independents having 1,000 more than the Bell. He attributes the success of his company in Louisville to the fact that the interests there are localized.

Former Governor Bunn spoke in praise of the good work being done in Philadelphia and the state at large by the Independents and predicted a still more successful future for the movement in Pennsylvania.

Other speakers who entertained the banqueters with brief talks along Independent lines were James B. Hoge, Cleveland; J. B. Ware, Detroit; Captain William Thompson, Philadelphia; Major Lewis E. Beitler, deputy secretary of the commonwealth of Pennsylvania.

All in all, the convention was a highly successful one and profitable in every way to those in attendance, the Pennsylvania State Independent Telephone Association being launched under the most propitious circumstances, insuring for it a bright and prosperous future and for the Independent cause in the Keystone state a mighty forward step.

SOUTHERN INDIANA INDEPENDENT TELEPHONE ASSOCIATION.

At the fifth annual meeting of the Southern Indiana Independent Telephone Association, which was held at Rockport, September 26 and 27, the following officers were re-elected:

President—Charles D. Knoefel, New Albany.
Vice-President—L. G. Davis, Salem.
Secretary—E. W. Pickhardt, Huntingburg.
Treasurer—Henry Thom, Lamar.

The meeting was well attended and there was no lack of interest throughout the proceedings. All of the Independent associations in the southern tier of counties were represented and arrangements were made for a closer alliance between them in affording long-distance accommodations.

Owing to the fact that President Knoefel was unable to reach Rockport until late Tuesday afternoon the opening session was not held until Tuesday evening, when the delegates assembled in the courthouse, where the subject, "The Needs of Independent Telephone Companies in Southern Indiana," came up for general discussion, the general trend of which was to the effect that greater harmony should prevail and a more determined stand be taken to effect universal co-operation in the extension of the service. A dozen or more of the delegates took part in the discussion and many hopeful ideas were advanced.

Following adjournment the telephone men wended their way to the city hall, where they found that a banquet had been spread for them, the quality and quantity of which were all that could possibly be desired, the committee of arrangements having left nothing undone to make this the most enjoyable feature of the convention.

The postprandial efforts were entertaining and to the point, the speaking extending over a couple of hours. A. J. Payton, manager of the Home Telephone Company of Spencer county, officiated in the capacity of toastmaster. H. J. Cole of Owensboro was the first speaker of the evening, his subject being "Our Guests." Other subjects and speakers were as follows: "What Shall the Harvest Be," by H. Landgrebe, Huntingburg; "The German Language on the Telephone," by Frank Beaucound, manager New Albany Home Exchange; "How Should the Telephone Be Managed?" by J. L. Arthur, Indianapolis; "The Supply Men," by F. M. Thorn; "Telephone Finance," by C. D. Knoefel, president Southern Indiana Telephone Company, New Albany.

The final session, which was held on the morning of Wednesday, was devoted to the election of officers and miscellaneous business, after which the convention was adjourned.

Five billion telephone messages in the United States in one year speak more for the power of the telephone in this country than anything else possibly could.

DIGEST OF TELEPHONE LITERATURE

Conducted by Samuel G. McMeen.

Submarine Telephone Cables—BREISIG.—*London Electrician, Sept. 16.*

In our October issue we gave at length a digest of an article in the London *Electrician* on this subject. The article in question was editorially rendered, and gave a treatment quite unusual in foreign journals. The item now considered is a letter from Dr. Breisig to the London *Electrician*, in which he advances the theory of a new type of telephone cables in which the important features are paper insulation over the conductor, the latter being covered by a closed helix of fine iron wire and the whole enclosed in lead. The Danish-Swedish cable originally discussed, contains a copper strand, 2.4 mm. diameter, with an iron coating of one spiral wrapping of 0.2 mm. wire. This conductor is insulated with gutta percha. In placing orders for the special telephone cables having a distributed inductance to offset the harmful effects of the capacity, the properties were well established in advance and it was found possible to execute a contract with the makers, in which the performance of the cables was guaranteed to quite a large degree. The results have shown that the new cables are successful from technical and commercial points of view, as well as in other scientific aspects, and it may be agreed that a distinct step has been taken in submarine telephone treatment.

LINE AND LINE CONSTRUCTION

New Danger to Lead Covered Aerial Cables—HESKETH.—*Proceedings International Electrical Congress*

Aerial cables in all regions have been found from time to time to suffer from the entrance of moisture through a hole in the lead sheath. The general conclusion has been that these holes were due to bullets, nails, the points of linemen's climbers, or some other mechanical cause, unless the perforation has seemed to result from a lightning discharge. This author is a telegraph and telephone engineer of prominence, being in charge of governmental communications in Australia. Cables in his exchanges have been damaged to a very great exent, as many as fourteen holes having occurred in sixteen inches of cable length. No cables used in Queensland have been immune from this trouble, although plain lead covered cables have been less subject to damage than have those covered with a tape. The trouble occurred most frequently during the rainy season, corresponding to our winter, and was commonly associated with the heavy lightning storms which prevail about that time. As so much rain accompanies that season, the existence of the holes is particularly annoying, as the cables fail very quickly. Believing that insects must be responsible for the trouble, in which belief Mr. Hesketh stood quite alone, he issued instructions for a search to discover them. Nearly two years elapsed before first absolute evidence was found, but in 1903 a certain black beetle was found in holes in the cable. Later investigation has discovered not only many other samples of the first found beetle, but of many others, and of their eggs and larvae. In the investigation these grubs were not only found in the perforations while still in progress of boring, but when transferred to sections of lead sheathing which could be kept under observation, the act of perforation and lead tunneling has been observed. Mr. Hesketh has made many photographs of the attacking insects and their work, and a drawing of one of the beetles shows very clearly how well nature has equipped that species for the seemingly hard work of drilling lead. No remedy for the trouble as a whole has yet been found. In addition to the beetles a certain caterpillar has been found to be able to gnaw lead, one of them being shut into a piece of wood by lead covered wires, having gnawed a hole nearly a quarter of an inch in diameter through the lead covering.

Concerning Telephone Lines—MCMEEN.—*Telephony, October.*

Currents passing through the earth as a result of the operation of street railway systems enter the sheaths of telephone cables, pass over them, leaving to the earth at another point; as this point of leaving is almost always moist, an electrical action eats away the sheath of the cable. There are several ways of preventing this, having the intention of carrying the current away from the cables without permitting chemical decomposition, or of preventing the current from passing over the sheath at all. Up to now the principal method has been to let the current pass over the cable sheath, but to take it away without harmful result.

Subway Construction—CRAIG.—*Telephony, October.*

The third article of a series. In preparing the trench to receive the duct material it is not necessary to sheet up the inside unless the soil has a distinctive tendency to cave. Planks placed against the sides will prevent this, and may be held apart and firmly in position by cross pieces wedged in tight; screw braces have been found handy and convenient. In blasting rock the chief importance is to prevent damage by blown pieces, and this is done by piling heavy timbers over the spot. Plate glass windows in the neighborhood should be protected from flying pieces of rock. The bottom of the trench should be paved with concrete three inches thick, tamped smooth. The duct material is then laid, and the ends properly joined, all the layers being held in place by cement. The sides and the top of the pipe are then protected by concrete so that the whole pass is inclosed in that material. Sometimes this concrete is omitted. Experience has shown that it is probable that a full, heavy surrounding of concrete is not always absolutely necessary. Fiber conduits have been laid with good success and if laid without concrete, planks should be used over the ducts. Creosoted wood pipe is the easiest and cheapest to lay, and a plank should be used over them unless concrete is placed on top.

Telephony in Central Texas—JONES.—*Telephone Journal, October 15.*

A description of the Independent system in Colorado, Texas, an interesting feature being that of a cable pole carrying nineteen cross arms of ten pins each. Counting one bracket on the pole under the bottom arm, the capacity of a pole is 191 wires. This condition, however, is the result of an unexpected growth.

Practical Circuit Testing—LINCOLN.—*Technical World, October.*

There are times when electricians are called upon to locate faults in electric bell and electric gas lighting circuits, and for such tests a telephone receiver and a battery form an outfit which will be very convenient. This article describes several methods of locating breaks, grounds and crosses, and illustrates them in four line drawings.

Interior Wiring for Telephones—COAR.—*Electrical World & Engineer, October 15.*

EQUIPMENT.

The use of a protector with all its elements, or a lightning arrester only, in immediate connection with the telephone at the subscriber's station, is a question which is not answered in the same way by all telephone companies. Those which consider the matter carefully sometimes decide not to place protective apparatus

at the substation when the wire to the station is insulated with a covering throughout its length. The practice of carrying lines almost wholly in cable, and of using insulated wire for the short length between the cable and the house, has reduced the hazard from lightning or excessive current in a very great degree. The proper place for a telephone protector is on the outside of the building, between the exposed outdoor wires and the unexposed indoor wires. Because of the protector being too delicate to be safe outdoors, all or a part of it is placed indoors. The best place is just inside the entrance. The fuses, as one element of the protector, may well be placed outdoors, as it is possible to protect them from damage by weather action. The ground wire from the protector should be short, direct, insulated, and of copper not smaller than No. 16 B. & S. It should be carried on cleats or knobs and through tubes, quite as if it were a power wire. Wires passing through outside walls should have tubes around them at a slant to prevent water running in. The article contains instructive information as to the best, easiest and simplest methods of running wires in a house, and closes with a most excellent series of seventeen rules governing the matter of size, character, location, and fastening of wires, character of grounds, and the location of the protector. The article is clear and logical, and should be studied by every practical man.

Selective Ringing Systems—O'BRIEN.—*American Electrician, October.*

The Dean harmonic party line system, manufactured and exploited by the Kellogg company, is here described and illustrated in detail. In this system the number of stations provided for is four per line; the signal is given by means of a bell, although it has but one gong, and the ringer is in series with a condenser across the pair of wires. The four ringers differ from each other in the weight of the tapper, and the length of the tapper arm. Each bell of a group of four is arranged to respond to alternating currents of about a certain frequency, and not to frequencies very greatly different. The currents for ringing are taken from four alternating generators in the central office, the frequencies being 1,000, 2,000, 3,000 and 4,000 cycles per minute. Each cord circuit may have associated with it a group of four ringing keys, pressing any one of which will call the particular station desired, or, if economy demands, one four-way key per operator may be furnished, pressure upon which may determine which station should be rung by the individual ringing key of the cord circuit. The former is the better way. If the ringing generators do not run at a constant speed, false signals will be given on the lines. In order to secure very constant speed of these generators they are connected to one shaft and driven by one motor. This motor is provided with an ingenious regulator of the centrifugal type, the action of which is simply to short-circuit the resistance otherwise in series with the motor field-magnets; this short-circuiting occurring when the motor is running too fast, and being broken when the motor is running too slow. As the insertion of a resistance in series with the field of a motor makes it run faster, and as the centrifugal contact is set so as to break contact at the critical speed, very close regulation indeed is accomplished by this means.

Telephone Engineering—KELSEY.—*Electrical World & Engineer, October 1.*

The earliest form of multiple switchboard produced by the Stromberg-Carlson company involved the use of a 40-volt battery, a cord circuit having no condensers or impedance coils, and a subscriber's telephone circuit having the secondary and receiver in series with each other, and with nothing else. The type of jack used was that having four springs and a test bushing, and in which, although a contact was broken by the insertion of the plug, the line connection was truly bridged. But one supervisory signal, and that a lamp, was provided for each cord circuit. This supervisory signal was under the control of both stations, and when both receivers were restored to their hooks, the lamp became lighted. A further development of this system involved the elimination of series signal contacts through the jacks, and further eliminated all but the test bushings and the single spring. The cord circuit remained of two strands, but by the use of two supervisory relays, two supervisory lamps were made possible, one being under the control of each subscriber. In this system also forty volts supply the signaling and talking currents, and the conditions at the subscriber's station remain the same. This system, which is described in detail, may be taken to represent an important type of modern practice.

The Telephone—TAYLOR.—*Sound Waves, October.*

The ninth article of a series, treating selective signaling apparatus and condensers. One of the systems of party line equipment widely used is that in which the ringer is provided with a spring holding the hammer toward one gong, except when current is passing, and the ringing is done by means of pulsating current of one polarity or the other. Each impulse throws the hammer to one side, and the spring pulls it back between impulses. The chief disadvantage of this system is the necessity of adjusting the spring tension to nearly an exact amount to fit each station, and the necessity of providing a source of ringing current of a constant frequency and nearly a constant potential. Drawings illustrate the connections of such telephones. In an effort to design a system of this kind, wherein one station may be called without calling the central office, certain arrangement of keys and a generator are provided, and these also are shown. On country lines when many are listening, it is quite impossible to ring from station to station. The insertion of a condenser in series with a telephone receiver at each station assists in enabling ringing to be done while receivers are off the hooks. Condensers are defined and the method of making them is described. Sometimes, due to the failure of the insulating material between the sheets of foil, condensers become short-circuited. By connecting them to an electric light circuit of reasonably low voltage, the foil will be burned away at the short-circuit, and the condenser restored to good condition.

Automatic Telephony—DURANT.—*Technical World, October.*

Extensive use of automatic machinery in manufacture is a distinctive evidence of the spirit of the present age. In fact it may be said that this age is an automatic one. Much that used to be done by hand is now being done by machinery with almost no control on the part of a human being. Now the automatic idea has been applied to the switching of telephone lines, and the states of the Union are already dotted with exchanges giving service to thousands of subscribers. The application of the automatic idea to telephony is not new, but it has taken nearly fifteen years for the first and elementary idea to be developed to a point enabling the machinery to serve with reasonable economy a large group of subscribers. Much energy, courage and capital have been absorbed, and a mechanism capable of switching together any two of tens of thousands of lines is the result. The article illustrates and describes the apparatus and the method of its use.

The Telephone in Railroad Operating—STONE.—*Telephone Journal, October 8.*

GENERAL TELEPHONE ENGINEERING.

Various railroads have shown an inclination to add the telephone to their existing telegraph system for the handling of trains, and it is probable that a further application will be made in the near future. This author describes and illustrates certain applications which have been made in connection with street railway work in Newark, New Jersey, a part of his illustration covering details of mechanism for block signal work.

Telephone Scouts for the Militia—GRAYNE.—*Western Electrician, October 15.*

A description of certain interesting features of the signal and telephone corps of the National Guard in encampment

in Indiana and Ohio. Scout parties, accompanied by hired laborers, are equipped with telephone apparatus and means for stringing telephone wires on the ground with great promptness.

What Telephone Engineering Needs—KELSEY.—*Telephony, October.*

A paper presented at the annual meeting of the Independent Telephone Association in St. Louis, September 21. Transportation, artificial lighting and communication are important factors in the development of a country, and the success our country has achieved in these particulars has been very marked. Communication, however, has been the least developed, and from an electrical standpoint, communication is one of the oldest members of the group; yet the telephone or telegraph engineer has been unknown by his title until very recently. Such a person existed, but because of the immediate and pressing needs of the moment in his actual work, he had no opportunity to talk or write. Only a few were thinking, and they were overworked. Muzzled opportunity, destroyed incentive and lowered dignity did their work well, and a great harvest awaited the brain of the engineer in Independent telephony. That he reaped well is no idle story. No longer ago than 1900, when Prof. Kelsey announced the name of a prominent telephone engineer as in his opinion third in engineering leadership, the results show that no other engineer in the United States so voted as to place this man's name even among the first twenty-five. Conditions to-day are different. The work of brave pioneers has told. Four magazines are devoted exclusively to telephone interests. Thousands of thinkers are at work on the problem of communication, and through dignified and proper publicity the profession is approaching its just station.

Salt Lake City Exchange—Telephony, October.

An extended description, well illustrated, covering the equipment, building, and subway system of the new Independent property.

Planning a Telephone System—MCMEEN.—*Telephony, October.*

A paper read at the St. Louis meeting of the Independent Telephone Association, September 22. Planning a telephone system would be easy if there were uniformity in the distribution of population and in prices of materials; if improvement in mechanism and method were not under way; if fashions in telephone things were constant, and if wealth and the topography of towns were uniform. In most small cities one office is enough. In large cities more than one office is usually necessary to keep down the cost of making the service. The multiple tap system of distributing cable conductors is now developed to a point where considerable economy is possible by its use. Every exchange ought to be planned in a way to insure successful long distance conversation.

Telephone Exchange Engineering—MANSON, LIBBEY AND SIMPSON.—*Telephone Journal, October 15.*

The twentieth article of a series, and treats of condensers. This article, like those which have gone before, is illustrated in the most exquisite manner, one of the authors being artist as well as engineer. Nearly all telephone condensers are of the rolled type, in which the two tinfoil plates and paper separators are continuous sheets. The article gives dimensions of parts and accurate description of the method by which the tinfoil sheets are rolled together with two sheets of paper between them. The paper is very thin and the thickness of the two sheets is only about 25-10,000ths of an inch. An advantage of using two thin papers rather than one thicker one, is that the holes, if any may exist, will not match and permit a short-circuit by the foil getting pressed through. The entire operation of manufacture is described in detail, and dimensions of the finished product are given.

Simple Three-Party-Line Telephone Systems—STRIPPEL.—*American Electrician, October.*

An ingenious arrangement of circuits by which three wires, or two wires and a ground, enable selective signaling between three stations of an isolated line.

Economical Features in Modern Telephone Engineering—STANTON.—*Proceedings International Electrical Congress.*

The author discusses at length the important problem of how many districts and how many offices are wisest to use in a large city. The reasons why more than one office may effect economy, while increasing some of the elements of cost, are treated in some detail. Mr. Stanton has given some thought to a new phase of furnishing service which embodies some of the features of the manual and some of those of automatic working, the automatic devices operating without the knowledge of the subscriber.

High Frequency Telephone Circuit Tests—KENNELLY.—*Proceedings International Electrical Congress.*

Heretofore it has been the custom to test telephone and telegraph circuits by applying a steady assigned voltage at the sending end, and measuring the strength of current received at the distant end through a milliammeter or an equivalent apparatus. In telephone work the simple tests suitable for telegraph purposes are not sufficient to tell all the facts necessary to be known. The author's object is to describe apparatus constructed for the express purpose of measuring the alternating current strength, at the frequencies of speech, received at the distant end of a telephone circuit, with a definite electromotive force impressed at the sending end. The measuring apparatus which has been designed, includes as an element, the "barretter" used in the Fessenden system of wireless telegraphy. This is a very small loop of very fine platinum wire, through which is caused to pass a small direct current. The received alternating current is then made to pass through this same loop in parallel with direct current, and the results are noted. The reason for a change in the reading of the instrument affected by the direct current is that the superposed alternating current heats the loop and increases its resistance. From this beginning are built up methods that result in measurements not previously possible.

Telegraphy and Telephony in Japan—OI.—*Electrical Age, October.*

This article, which is the paper read by Mr. Oi at the International Electrical Congress, was digested in our last issue. This reference is to point out the fact that the *Electrical Age* reproduces photographs not appearing in other articles, and in the manner usual with that journal. The prevalent double pole construction emphasises the fact that aerial cable, while extensively used, is not yet installed in the degree practiced in this country.

The Patent Situation—CLEMENT.—*Telephony, October.*

A paper read at the St. Louis meeting of the Independent Telephone Association, September 22. A man entering Independent telephony in the early days needed some money, more sense, and a lot of nerve. Those who led the battle in the early days had to be fighters and they were. Civilization rests on two factors: Transportation and communication. The time will come when the electric telephone and electric railway will encompass and cover this country from ocean to ocean, and the telephone at least will cross the seas. Four thousand two hundred and ninety-eight telephone patents have been issued. The modern telephone plant is not essentially telephonic. It comprises really a power generating and distributing system, with an auxiliary telegraph system, whereby the supply of power is controlled. The only things telephonic about it are the transmitters and receivers at the subscribers' stations and the central office. There are 125 patents for automatic systems and apparatus. No living man knows all the details of all the apparatus of those 125 patents, not even the inventors themselves. The total number of telephone patents have 48,038 claims, each of course standing as a distinct patent for what it covers. The patents

FINANCIAL AND ECONOMIC.

themselves, without regard to the value of the inventions, have cost over $650,000. About half of the total number of patents is controlled by the Bell company. Independent telephone securities are absolutely safe at this day, so far as patent suits now being prosecuted, or which may be brought in the future by the Bell company may go. All that is needed to create confidence in the situation is thorough union.

ndependent Finances—DICKSON.—*Telephony, October.*

A paper read at the St. Louis meeting of the Independent Telephone Association, September 22. Two telephones in a house or office are open to objection, but the writer is in a measure in accord with the Bell company when it declares that the telephone is a natural monopoly, and insists that there ought to be but one system in any community. No doubt there ought to have been but one system. The Bell company being in possession ought to have given good service at reasonable charges, thus rendering competition practically impossible. Unfortunately it never did give proper service at proper rates until forced to it by Independent competition. When the Independent company began work in Cleveland, the Bell development and rates were such that every business man was paying the Bell company nearly three cents a year for each possible connection; not each possible conversation, but for the privilege throughout the year of calling a given station if he wanted to. For example, to be able to call a thousand subscribers for $10 a year is one cent per possible connection per year, and this is what is meant. After the Independent system began, the Bell company increased its development and decreased its rates so that the Bell subscriber who before paid nearly three cents for each possible connection per year, now pays only a little more than one-half cent each. The Independent rates are such that if a party takes both telephones, he will pay at the highest less than six mills per year for each telephone to which he has access, against three cents in the days of monopoly. In other words, competition has reduced the cost to one-fifth of what it was, and bettered the service. If you had two telephone companies in a city, one owned in Boston and the other in Cleveland, neither company would have an advantage. But the Independent exchange in each city should be owned and controlled by its own people. This is good, but more is necessary. Efficient service is absolutely essential, and the employes who make the service must be picked with care, intelligently trained, and kept interested. The wise man does not want about him a lot of drifting incapables, but people interested in the work and encouraged by its success. Mr. Dickson declares himself as a firm believer in profit sharing with his employes. Pay first of all fair wages, and then give a reasonable percentage of profits to the employes.

So excellent is this paper that it is difficult to digest. It is recommended, however, for frequent re-study by even those who heard it read. There is no phase of the telephone business which its genial humor, sound wisdom and keen insight does not touch. Its writing and presentation constitute a distinct addition to the literature of the art, and to the general record of common sense as well.

The Value of Organization—HOGE.—*Telephony, October.*

A paper presened at the St. Louis meeting of the Independent Telephone Association, September 21. The association was organized in 1897, principally for the purpose of defending patent litigation then threatening the Independent movement. It is common knowledge that this purpose was carried through to complete success, and that the Independent movement, with that success to encourage it, has grown beyond all expectations. During the past ten years the Independent interests have installed more than 2,500,000 telephones in the United States. The long distance service of the new systems in many cases is equal to that of the Bell company, although the latter has had a longer time, and in some localities greater resources. For complete success, it is important that the Independent operators reach reasonable uniformity and a high excellence in methods of bookkeeping, operating, and mutual relations. Not only rules and regulations, but advertising methods, character of equipment, and construction would be bettered for all by the use of uniform procedure. It is no more necessary to consolidate the local properties than to consolidate all the steam or electric railroads in the country in order to operate them successfully on a uniform basis. Rolling stock and tracks of the latter are so thoroughly standardized that they can be operated successfully from one end of the country to the other with any desired degree of interchangeability.

Telephony in London and New York—Electrical World & Engineer, October 1.

Telephone service at its best in this country, compared with its best in London, or other cities abroad, seems to have quite the best of it, even when the comparison is made by a visiting Englishman. Recent statements from such men are to the effect that the proper method of charging for service is that which has been inaugurated and perfected in the United States, the charge being in proportion to the amount of use. Sir Philip Burne-Jones states that on his return to England, the three things which he missed most notably were his beautiful snow-white tub, the electric lights, and the telephone. One of the healthiest signs of future British improvement in telephone matters, is that the value of the service is beginning to be recognized, so that in time even the most conservative may give in and utilize the advantage that they have so long neglected.

Telephony in Pennsylvania—Electrical World & Engineer, October 1.

Secretary Brown of the Department of Internal Affairs reports to the General Assembly of Pennsylvania upon financial statistics of a large number of telephone companies. Most of them are not connected with the Bell interests. An analysis of the results is interesting and shows that the average annual gross income is seven per cent of the investment. This low figure is largely accounted for by the fact that about one-fourth of the companies reported upon are mutual organizations, and are not operated for profit in the commercial sense. The earning of seven per cent, therefore, would really be much larger if the mutual companies were excluded from consideration. It might be hoped that these reports would enable an accurate understanding to be reached as to how much a telephone plant ought to cost per subscriber; and as the number of subscribers served by different companies varies from 5,000 to 18,000, it might seem possible to secure information of a very important character. This does not seem to be borne out by the returns, because the investment per telephone runs from $12 up to $998. Only twenty-three telephones are reported by the company showing the latter cost, which would seem to indicate that that company has many miles of toll line, and no exchange. The $12-per-station company was a mutual, having 425 instruments. The company having eighteen thousand telephones reports $253 cost for each. Taken altogether it seems that a much more careful analysis must be made before information of any real value can be gained for future guidance.

Telephone Progress—DOUGHERTY.—*Telephony, October.*

An address delivered by the president of the Independent Telephone Association of the United States at the St. Louis meeting, September 21, 22 and 23. The convention spirit is one of the characteristics of this wonderful age. The good of such gatherings is not always measured by the size of the attendance and the enthusiasm manifested. Patience, judgment and perseverance are the essential elements in the achievement of great success. The farmer who shears the fleece and cares not for the sheep has no reason to complain if the flock does not thrive. So the manufacturer who bears

too heavily on the operator may expect slow and doubtful collections, and the operator who gives poor service or makes extravagant charges may find his flock scattered. Essential to future success is to secure better apparatus and better construction, and to give the public more painstaking care.

The Situation in Minnesota—JAMES.—*Finance, October 15.*

An address by President J. H. James of the Minnesota Telephone Association. Do you know that there have been more bank failures in the past six years than there have been Independent telephone failures? Do you know that the Michigan Bell failure was ten times greater than all the Independent failures put together in the last six years? When we think of the inexperience of almost every Independent company, and of the millions spent in fighting the enemy, is it not strange that there have not been more failures? Don't you wonder when you think that there are more Independent telephones in operation than the Bell company has been able to put into service in thirty years? Don't you know that if the Independent companies in this state do not band together for mutual protection and assistance, they are their own worst enemies? I have in my possession information upon some acts of our Bell enemies that would put a St. Louis aldermen to shame. Much more like this, and all good sense.

Telephone Development in New York City—Electrical Review, September 24.

Ten years ago the New York Telephone Company abolished flat rates and introduced measured service. Together with this change in method was introduced a more aggressive policy with reference to private branch exchange development, and at this time there are nearly 150,000 stations in service in Manhattan and the Bronx. Sixty thousand of these telephones are in private branch exchanges, of which there are 5,000, the average number of stations per such exchange being twelve.

Telegraphy vs. Telephony—Boston Transcript, September 12.

The telegraph is much older than the telephone, yet in the United States the latter is used fifty times where the telegraph is used once. Year before last the number of telephone messages transmitted in the United States alone was five billion. The use of the telegraph has diminished, and by comparison with the use of the telephone and the mail, and the growth of general prosperity, the only answer can be that it is the telephone which has caused the telegraphic falling off. No inquiry has developed that the telephone requirements of any community, city, town or country have yet been satisfied. The telephone was once a luxury. It is now a necessity. It makes of the back-townsman an individual and independent force, and not a mere unit to be herded with others of his kind.

Theory of Telephone Exchange Development—DE LA TOUANNE—*Proceedings International Electrical Congress.*

The author analyzes the charges against a telephone enterprise into capital as a permanent investment, floating capital, maintenance, depreciation, sinking fund, and interest, contingencies, resources and dividends. His analysis is intended, if carried out, to enable calculations to be made with reference to the finances of any enterprise of a telephone character.

UNDERGROUND CONSTRUCTION.

Part of the telephone system at Denison, Texas, is being put underground.

The Home Telephone Company of Riverside, California, is placing its wires underground.

The Lee County Telephone Company is laying an underground conduit system in Dixon, Illinois.

The Home Telephone Company of Carthage, Missouri, is putting some of its wires underground.

The Home Telephone Company at Ocean Park, California, is constructing an underground conduit system.

The York State Telephone Company is constructing an underground conduit system in Binghamton, New York.

The Colonial Telephone Company of Newburgh, New York, will lay 16,700 feet of new underground cable, some of which is 400-pair.

A conduit system is being built in three sections of Syracuse, New York. The conduits will be four miles in length and will cost $80,000.

The Farmers' Mutual Telephone Company at South Whitely, Indiana, is moving into larger quarters and will install 1,300 feet of conduit.

The Farmers' Mutual Telephone Company of Columbia City, Indiana, will construct 2,000 feet of underground conduits for its wires and cables.

The city council of Houston, Texas, has instructed the city engineer to prepare specifications for the Citizens' Telephone Company for the immediate laying of 3,000 feet of underground conduits according to its franchise.

The Northern Illinois Telephone Company is now busily engaged in the preliminary work towards doing away with all poles in the business part of Sandwich, Illinois. The cables now up, together with 7,000 feet of new cables, are to be put in conduits under ground.

The telephone company at La Porte, Indiana, intends to place all its wires in the downtown district underground and in time extend the same to the residential districts. The company expects to put about 10,000 feet underground this fall.

PROMINENT IOWA INDEPENDENT WORKER.

One of the best known men in the Independent telephone field in Iowa is J. S. Bellamy of Knoxville, president and general manager of the Des Moines Mutual Telephone Company, which organization has, within a comparatively short time, increased its number of telephones from 600 to nearly 3,000. This company is the head of the Iowa mutual system which now has about 200,000 telephones in use. The Des Moines company is putting the finishing touches on a handsome three-story exchange building 66x132 feet, modern and handsomely appointed in every way. This building will be entirely occupied by the Mutual company. Mr. Bellamy is superintendent of construction, as well as manager of the entire work. He has other property interests in the telephone system of Hutchinson, Kansas, and in Knoxville as well, also a country line extending from Knoxville through Bussey, Hamilton and Lovilia to Albia.

NOVEL USE FOR THE TELEPHONE.

Another illustration of the many uses to which a telephone can be put comes from Paducah, Kentucky. It had been decided to paint the inside of a large standpipe belonging to the water company. To do this a raft was constructed to float upon the water within the pipe and serve as a platform upon which the painters might work. A telephone was installed within the pipe and connected with the pump room of the plant. When the men had painted as far as they could they signaled the engineer to raise or lower the level of the water as desired. In this way a great deal of time was saved, as well as the cost of staging which had previously been used.

According to the report of the state tax commissioners the mileage of the lines of the allied Bell telephone companies in Indiana is 83,000 miles, and of the Independent companies, 64,000, gains of 6,000 and 16,000 miles respectively over 1903.

Subway Construction

D. R. CRAIG

PART IV.

MANHOLES.

MANHOLES form a very essential part of underground systems and require careful design to properly adapt them to the conditions to be met. No arbitrary rule can be made for the maximum distance they should be placed apart, but they are usually required at distribution points and intersections in the lines at distances so close that cable can be drawn from one to the other without difficulty. Their size should be determined by the number of ducts that are to enter them, as well as the number of men that will be required to work in them at one time. Manholes six feet across and six feet deep would meet all usual requirements for a large system, while for smaller systems, or the outlying portions of large ones, they might be made as small as 3½ feet across. These are inside measurements. They are of two forms, round or elliptical, and square or rectangular, and may be constructed of either concrete or brick.

The concrete manhole is built over a templet, or mold, and while it may be cheaper to build it has many disadvantages. It has to be built strictly to the mold, and no slight changes are possible, though they might be advisable or even necessary. In case alterations or additions to the system of ducts are necessary in the future it would be a difficult task to change the manholes without tearing them down and rebuilding them. The brick manhole has all the advantages that are absent in the concrete vault and they can be built almost, if not quite, as quickly and cheaply. Composed of small units, the size and form may be varied, even at the last moment, to conform to any conditions which may arise. The shape may be changed as often as desired, though for all ordinary purposes the round or elliptical vault is better because there is no waste space, as in the corners of square manholes, and it can be built more economically, the brick, mortar and cover being the only materials required. Unless built in soil in which the drainage is poor, sewer connections from manholes are not necessary. Where such drain pipe is necessary it should be a six-inch clay tile provided with a trap to prevent sewer gas entering the manhole.

In excavating for either a round or square vault a space should be marked on the pavement slightly larger than the outside dimensions of the completed manhole, and the excavation made, as in the case of a cistern, to the required depth. In digging round holes in soil inclined to cave in one should have made a large iron ring—say six feet in diameter—of half-inch by three-inch bar iron, and as the hole is lowered let this ring down into it and drive sheeting on the outside close together. This sheeting is driven lower as the excavation proceeds and prevents any caving, the iron ring holding it firmly in place. This ring can be procured for five or six dollars and is a good investment. In sinking square holes in this same kind of soil, the sheeting is used and is braced by cross-pieces or screw braces across the hole.

The walls of brick manholes should never be less than eight inches thick and where extra large manholes are built in streets where the traffic is unusually heavy, they should be twelve and sometimes sixteen inches thick. All brick should be thoroughly wet before being used. In the round vaults the brick work should be corbeled in at the top to support the manhole cover and its frame. In the square vaults an iron frame work has to be used for the top of the manhole. Angle and T iron, or sixty pound second-hand steel rails are used for this work, laid close enough together to take the brick between them with a course of brick laid on top. An opening must of course be left for the iron cover.

Owing to the impossibility of their falling into the manhole through careless handling, a round, rather than a square, cover should be used. This cover and its rim or framework is made of cast iron. Water tight covers are not necessary, though they are quite frequently used, but they are an extra frill that adds considerably to the cost. A good, plain, heavy cover, with perforations in the lid for ventilating purposes, is the most desirable. The best cover is made in this style and in different weights, with a twenty-six inch opening, and the price is by no means exorbitant.

The entrance of the conduit into the manhole should be deep enough to allow for corbeling over them for the cover, and yet not so close to the bottom as to make the handling of cable inconvenient. The ends of the ducts should never be brought in flush with the manhole wall, but rather set back a little, forming a pocket. This pocket should be beveled and nicely finished off with mortar. This enables the cable to be bent more gradually and lay close to the walls. The ends of all the ducts should be even, and for this reason they may, in some cases, have to be cut when laying. Cable supports should either be put in the walls as they are built up or fastened on afterward.

The office manhole, having to accommodate all the cables that may ever lead into the exchange, should be larger and more elaborate than any of the others, and when possible should communicate direct with the basement of the exchange building by means of a door or other large opening.

Where a conduit system is properly constructed there is little likelihood of trouble from the accumulation of gas in the manholes or ducts, and especially where a manhole is used which provides for ventilation. However, whenever work is to be done in a manhole, it is well to remove the cover, not only of this manhole, but of the nearest one in both directions, and allow a few minutes for a fresh current of air to pass through, thus purifying the atmosphere in the subway. This is a little thing to do, and prevents the kind of accidents, which, though rare and unlikely to happen, are usually serious and costly when they do happen.

DISTRIBUTION.

Distribution from telephone subways to subscribers is made in two ways, from poles situated in the center of a block or district, or by connection with the cellars of buildings to be supplied. In the former case an underground lateral is laid from the nearest manhole in the street or alley, as the case may be, to the distributing pole, where it is joined to an iron pipe, or a size to fit the duct. This pipe takes a gradual bend up the pole to a point high enough to protect the cable from injury by passers-by. The distributing cable is pulled through this duct and pipe to the terminal box at the top of the pole where it is opened and distributed. The same method is used at the end of the subway district in going from the underground to an aerial lead.

For sub-cellar distribution the lateral is laid from the nearest manhole direct into the cellar of a building, entrance usually being made to that part of the cellar under the sidewalk. The cable is brought into the cellar, and if more

than one building is to be supplied from the same cable, it is carried along through cellar walls from one building to another until the last distributing point is reached.

Under both methods of distribution at least two lateral ducts should be laid. In case of future additions or changes it is unwise to be limited to one duct when the difference in original cost is only the price of the small amount of conduit necessary to lay the extra duct.

LABOR AND MEN.

It is economy in doing subway work to use a sufficient number of men to carry on all departments of the work together and to the best advantage. The men should be organized and the work so systematized that the best results are secured from the labor employed. In the case of skilled labor the best men available should be secured, for they are the cheapest in the long run. Plan your work so as to keep the high priced, or skilled labor, busy and the rest will have to work fast to keep pace with them. Next under the superintendent in charge, or the engineer, should be the general foreman, who should be experienced and a pusher. He should have direct supervision of the work and attend to the gathering and distribution of material. There should be one or two sub-foremen, according to the number of men employed and the exigencies of the work. Where no timekeeper is employed the general foreman should do that work. The excavation can be in charge of one sub-foreman, though when a piece of work is first opened nearly all the men are put at that work.

The general foremen should have direct charge of the men laying the conduit and all help used there, including concrete mixers and haulers, conduit passers and masons' helpers, whether on conduit laying or manhole building. This part of the work should be pushed rapidly and it will then keep all departments busy. The work done by the "back gang," such as reconcreting, repaving, hauling away surplus dirt and cleaning up, should be in charge of another sub-foreman, who also has charge of the teams. It is the best plan to so lay out your work that when night comes you have as little trench open as possible. Put as many men as you can spare to excavating in the morning. As soon as your trench is ready begin laying conduit, taking what men you need for that. Six men should be enough to mix concrete and one of them should be a "straw-boss," superintending the mixing, seeing that the work is kept up and no more concrete is mixed than necessary, noting that the proper proportions of material are used and the mixing properly done, and also keeping account of the amount of material used. This man should be paid a little extra. As fast as the "pipe" is laid, those excavators not busy on other work should be put at filling and tamping and as the other work is completed those doing it may also be put at this filling and tamping. The work will soon so shape itself, with good management, that each night will see little, if any, of the street left open.

One man should have charge of the tool box, giving out the tools in the morning, having them returned to the box and locked up at night, and seeing that they are kept in repair. It should be hustle and push from beginning time in the morning to quitting time at night. If your foremen are hustlers and pushers your men will soon become imbued with the same spirit. Weed out all sluggards and drones without delay. A few examples in this direction will have a salutary effect.

RECORDS AND DATA.

At all stages of the work accurate records and measurements should be kept. The engineer or superintendent should have a field note book for this purpose. This may be ruled according to the form presented herewith. The first column shows the location of the trench, say from manhole No. 1 to manhole No. 2, the second column showing the distance from the curb line to the center of the conduit, and the third column the average depth to the bottom of the trench. In the next column should be set down the distance from one manhole to the other, measuring from the center of manhole covers. The next column should show the number of ducts laid, and the last column the duct feet, ascertained by multiplying the distance by the number of ducts. This record is good for permanent use in the form given, and should also be used in transcribing the record onto the completed plans of the system.

Location of Run	Dis. from Curb	Av. Depth	Dis.	No. of Ducts	Duct Ft.

In another part of the book should be kept the lists of manholes, their numbers and locations. Manholes should be numbered as they are built, the first one constructed being No. 1, and so on. These numbers are only temporary and are given merely to identify the manholes until permanent numbers are given after the completion of the work and the making up of the complete plans. At that time a good idea is to give the office manhole No. 0, and all manholes lying in one direction from the exchange even numbers, and all lying in the opposite direction odd numbers. Thus the reference to a manhole by its number would indicate what direction it lay from the exchange.

A detailed record should also be kept of each manhole, showing depth, diameter, number of ducts entering from each direction, the distance from the center of the vault to the face of the ducts, and the distance around the walls from the opening of one set of ducts to the opening of the other. This record is essential in getting up cable specifications in computing measurements.

A daily work report should be made by the general foreman and by him turned over to the superintendent. Information as to work done and material used is procured from the sub-foreman in immediate charge of the work, but all measurements should be taken by the general foreman at quitting time each night. From this report can be computed the cost of the work as it progresses, showing the lame spots which can be promptly remedied. The accompanying form —"Foreman's Daily Report"—has been found an excellent one for this report. In the space devoted to "Remarks" may be set down the number of feet of trench re-concreted and repaired, and also explanation of any unusual conditions which may exist.

SUBWAY DEPARTMENT.

FOREMAN'S DAILY REPORT.

City..... Date..... Weather.....
On..... Between..... and.....
Which side of Street..... Distance from Curb.....
Kind of Pavement..... Nature of Soil.....
Depth of Trench.... Width of Trench.... No. Ft. Trench Dug....
Kind of Conduit..... No. of Ducts..... No. Ft. Conduit Laid....
No. Manholes Built... Size of Manholes... Depth of Manholes...
Am't Cement used..... Am't Sand used..... No. Brick used.....
Am't Planking used.... Am't Rock used .... Am't Water used....
No. Ft. Trench filled.....No. Ft. Pavement relaid.....
No. Loads Dirt hauled.....Distance hauled.....
No. Ft. Trench partly dug..... No. Ft. Trench partly filled.....
No. Manholes dug, or partly so, but not built up.....
No. Manholes partly built.....
No. Laborers employed.....Total hours worked.....
No. Masons employed.....Total hours worked.....
No. Teams employed.....Total hours worked.....
Remarks .....
.....
.....

.....,
Foreman.

INSTALLATION OF CABLE.

When the underground system is completed it is ready for the installation of cable. First the ducts must be rodded

—that is, a wire drawn through them so that the rope can be pulled through to draw in the cable. In all cases where subways are put in by contract all the ducts should be rodded before the job is finally accepted from the contractors, in order to be sure they are clear. Where the company itself is doing the work this rodding of all the ducts is optional, in most cases only those to be used in the first installation of cable being rodded. This task is done with a set of rods, which are usually three feet long and put together, as they are pushed into the ducts, by means of joints which are easily and quickly fastened together and have some play. When the chain of rods reaches the second manhole, a No. 12 or 14 iron wire is fastened to the last rod and pulled through, the rods being disjointed as they come out of the ducts in the second manhole. If the rodding is to be continued in a straight line, they need not be unfastened but can be fed into the duct ahead and pushed by the man in the second manhole. In the head end of the first rod a gasket or swab should be fastened to clean out any dirt there may be in the ducts. If the rods meet an obstruction in the ducts its location can be determined by drawing out the rods and measuring them, and finding the same distance on top of ground. The conduit at this spot should be opened and the obstruction removed. Where proper care has been taken in the laying of the conduit this is a difficulty that should never be met with.

The heavy rope by which the cable is to be drawn in should be fastened to the wire and pulled through, passed over grooved rollers in the second manhole, taken to the surface and wrapped around a capstan or drum, which is operated either by hand or horse power, or more recently, and the best way, by electric power. The cable is fastened to this rope and drawn in the duct. The fastening or hitch is made by binding wire over the end of the cable for a distance of about two feet, the wraps being made so that each piece of wire presents a loop at the end of the cable running through an eye fastened in the end of the rope. The cable reel should be placed on jacks or horses over the manhole, so that it will revolve as the cable is unwound, and it should pay off the top of the reel. In order to prevent the cable from binding or straining as it enters the duct a man should be stationed in the manhole to guide it in straight, and in all cases a piece of sheet lead should be put in the mouth of the duct to protect the cable armor at that bearing point, and should be left there. Slack should be taken at each manhole for splices and to allow the cable to lay close to the walls, provision having been made for this in the specifications. Cables should be arranged systematically in manholes resting on their proper hangers and extending from one duct to the other without interfering with other cables. When the piece of cable is drawn in and cut off the main cable on the reel, all ends should be tightly soldered at once to prevent the entrance of moisture.

CABLE SPECIFICATIONS.

When the first installation of cable is settled on, care should be used in the making of specifications that they be correct and also plain, for they are used both at the factory where the cable is made and by the men drawing it in. The records made as the subway work progresses are used here to great advantage. It is better to carry all cables supplying aerial leads direct from the exchange to the first cable pole without making any taps in them, leaving the distribution inside the underground district to other cables. These may be designated as trunk and distributing cables. The best way to outline the making of a specification for cable from one manhole to another is to give an example. We will suppose that the distance from the center of one manhole cover to the next is 425 feet; that the duct openings in one manhole are set back two feet six inches from the center, and in the other three feet, making five feet to be deducted from the length, leaving 420 feet. To this should be added the distance half way around one side of the manhole wall, say four feet, also twenty inches for the splice. (Twenty inches for splicing should be allowed for cables of more than 100 pairs, and eighteen inches for smaller cables.) This would make one measurement 425 feet, 8 inches. To this one should add one-half of one per cent, allowance for variation, bends in manhole, etc., or say two feet, two inches, which would make the complete measurement 427 feet, 10 inches.

The specifications should designate what duct the cable is to go in. The ducts in a manhole are numbered by turning one's back to the exchange, beginning at the lower left hand duct and reading from left to right. Thus in a twenty-four duct lead, the lower left hand duct would be No. 1, and the upper right hand duct No. 24. The lower ducts should be used first, so that in future installations the way will be clear and cables will not have to be fed under those already in place.

Our specification for this run of cable would read:

Two hundred pair in duct No. 1 from manhole No. 1; west to manhole No. 2, 427 feet, 10 inches.

The same procedure would apply from one manhole to another until the proposed end of the cable is reached. Each cable should be numbered and in general terms it should be stated in what direction it runs. For instance, the heading of the specification might be:

Cable No. 1—Distributing cable extending west and northwest from exchange.

In trunk cables the same size, or number of pairs, will prevail clear through to the end, while in distributing cables the size will gradually be reduced, as the different distributing of points are supplied, until the pairs are all used.

CHICAGO'S BUSIEST MAN.

Away up in the top of the Illinois Tunnel Company's building, in Chicago, is a luxuriously appointed flat—the only flat, by the way, on the elevated railway loop—where George W. Jackson lives with his family. Mr. Jackson is the engineer who is so successfully directing the forces which, out of sight and out of sound and all unknown to the majority of people, are boring the long system of tunnels under Chicago's streets. No man in Chicago is busier or more in demand day and night than Mr. Jackson. He never can call his day's work done, for his activities extend all through the twenty-four hours of each day. He could not get home to be with his family, and so he brought his family down town to be with him, and has provided for them a flat whose fittings and furnishings are said to have cost $15,000. The unique feature of the appointments of the flat are the telephones which bristle on every hand. Each room has its telephone so that no matter whether Mr. Jackson is taking a cat nap on the parlor divan, or indulging in a good cigar in the smoking-room, or eating dinner with his family in the pretty dining-room, or taking a bath in the marble tiled bath-room, he can instantly attend to the multitude of details of the work of digging tunnels. Literally he has a telephone tagging him around wherever he goes. And it is because Mr. Jackson is ready, day or night, to solve problems and smooth over difficulties which may arise in connection with the underground work, that his friends declare that he is the busiest man in Chicago.

The will of Charon Briggs, which was made by telephone, was recently filed in the Probate court in Belleville, Illinois. The instrument was made over telephone for the reason that the testator was confined in the St. Clair County contagion hospital with smallpox. Mr. Briggs telephoned his wishes to the matron of the county farm, where they were taken down in writing and attested by the attendant. He died two days later.

Dunbar 2-Strand Common Battery System

PROF. JAMES C. KELSEY

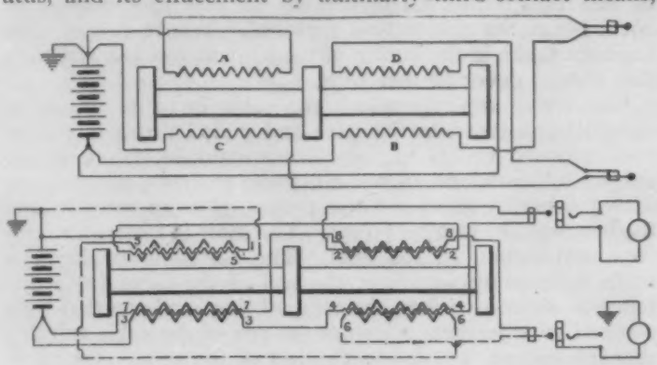
WHEN a company, or engineer, or group of engineers enter upon the development of a certain line of business, based on an original idea, their succeeding efforts seem to follow along a well-defined and slowly widening path. Nothing revolutionary appears on the surface, and the improvements revealed to the customers are simply increments to the original idea. This is particularly true as concerns the telephone industry. During the period of patent-office protection, the various developments brought out by the engineers connected with the telephone interests followed each other in a quiet and logical manner, and at no time did they depart far from a beaten path. And when the Independent interests were given freedom of thought and action, their efforts followed along this same beaten path. Only for a short time, however, for their work took on the marks of originality, and departed entirely from past traditions. In pointing out the instance where this was accomplished, the features of various succeeding commercial systems will be briefly considered.

One of the first efficient landmarks in the switchboard science is the series grounded system. The earth served as a return, and the low resistance line drop was necessarily disassociated from the line during connection. This was accomplished by a two-strand cut-off jack, having one spring for the talking contact, and a sleeve or thimble to guide the plug, and to hold it properly. The entrance of the plug raised the spring from a rest contact, which was connected to the drop. As the board grew in size, a busy test for the multiple of jacks became necessary, hence the use of sleeve as a test terminal. Having no operative function otherwise, the multiple of sleeves was normally insulated from everything. When the plug was inserted, being of solid metal, it brought the sleeves into contact with the talking circuit, which put them at the potential of the subscribers' earth. To utilize this changed condition of the sleeves during usage, a battery was placed in the operator's talking set in such a manner that when the listening key was closed, the tip of the plug assumed the potential of the battery, which upon coming into contact with a grounded sleeve caused a flow of current in the operator's receiver, and the subscribers' receivers, as well.

The advent of the trolley system changed the telephone map, to to speak. To avoid the disturbances, a metallic circuit became necessary for most of the lines, and its connection with a grounded board was nicely accomplished by placing a repeating coil directly in the metallic line. In many places, the number of metallic lines grew to exceed the number of grounded lines, which led to the demand for a board giving preference to metallic lines, as two repeating coils between two metallic subscribers was far from desirable. This resulted in a somewhat revolutionary step, the bridging self-restoring drop system.

This system began the era of local electrical actions in conjunction with the talking circuit. The sleeve was still the test terminal, and had the added function of conducting the current through the restoring winding of the drop. The test terminal was normally at earth potential, through the restoring winding, and was raised by the entrance of the plug. To detect this changed condition of the sleeve, the induction coil secondary and the receiver windings were halved, and a ground placed at their center, so that the closing of the listening key would give the test, and the circuit would not be unbalanced during ordinary operating. At this stage, the two-strand system stood a chance of usage, but for some reason the designers did not care to use the sleeve as a combination talking and testing terminal. So they added a third contact, or a second talking spring to the jack, and passed from one-strand into three-strand practice. The repeating coil was still evident, to connect dissimilar lines. But the main or revolutionary feature was the departure from the cut-off principle, by the use of permanently bridged line drop, which was made possible in a multiple system by the simple effacement of the signal proper during a cord connection.

The use of a permanently bridged line signalling apparatus, and its effacement by auxiliarly third-contact means,



FIGS. 1 AND 3.

had its influence upon the next, or common-battery era. In this system, the battery and line relay is permanently bridged across the line circuit, and the line signal proper, or lamp, is effaced, or partially extinguished by means of devices working in conjunction with the sleeves. For some reason, this system has not been given general adoption.

The next system, the present licensee common-battery system, shows a return to first principles, inasmuch as the line-signalling apparatus is entirely disassociated from the line when on connection, and the subscribers talk through the clearing out signal, now known as the disconnection signaling apparatus. The use of three strands came naturally into use, as the restoring winding had the same relation to the sleeve, or test terminal, as the cut-off relay winding of the present system has. In fact, there is not any evidence that the two-strand system was considered.

As the repeating coil is used in the first two-strand common battery system brought out by the Independent interests, having double disconnect or supervisory signals, it must be shown that while they perform many of the same functions, in both licensee and Dunbar systems, there is a radical and necessary difference. The repeating coil that will operate successfully with the Dunbar circuit will not operate successfully with the licensee circuit. There is a reason, and that is, the Dunbar circuit is confined to metallic lines, while the licensee circuit embraces three conditions of service, metallic and metallic, metallic and grounded, and grounded with grounded.

When the common-battery systems were placed in operation, the cord circuits were equipped with a repeating coil, having four windings, arranged on a core, as shown in Fig. 1. The quarters of the coil belonging to the tips of the plugs, *A* and *C*, are wound on what we may call the left end of the

Paper read at the International Electrical Congress at St. Louis.

core, while the quarters belonging to the rings, or other talking strands, *D* and *B*, are wound on the right, making two possible separate magnetic circuits, acting in the same direction. In Fig. 2, the use of the coil in circuit is illustrated, in which *A* and *B* are the quarters furnishing current to the metallic line, and *C* and *D* the quarters connecting the grounded party. According to practice, there are three grounds when a grounded line is concerned. One at the subscriber's station, one at the arrester frame, and one at the battery. This means that, when a cord circuit is placed in connection with a grounded line, the tip quarter of the coil, *C*, is shortcircuited.

If, according to Fig. 2, the metallic line parallels the trolley for considerable distance, both its wires are subjected to an electrostatic potential, equivalent to the electromagnetic potential of the trolley wire. These electrostatic charges, alternating in character, are seeking the earth, and pass through windings *A* and *B* on their way. If *A* and *B* presented equal retarding effects to these alternating charges, then balance would result, and a quiet connection given. Unfortunately the windings *A* and *B* do not present equal effects toward these charges, and great noise results upon a grounded connection. The effects are unequal in *A* and *B*, because the windings *C* and *D* are unequally loaded. *C* is virtually shortcircuited, and has the greatest possible weakening effect on the inductive properties of winding *A*. Winding *D* having a line, instrument and common return in circuit does not have as great a weakening effect on *B*, as *C* has on *A*, hence the unbalance, and the consequent noise.

As the licensee companies had an object in maintaining grounded service, a coil had to be devised which would preserve the static balance under all conditions of service. The condition in question is the metallic and grounded connection, which means that the tip quarter of the coil on the grounded side is idle. In Fig. 3, the idle quarter has been

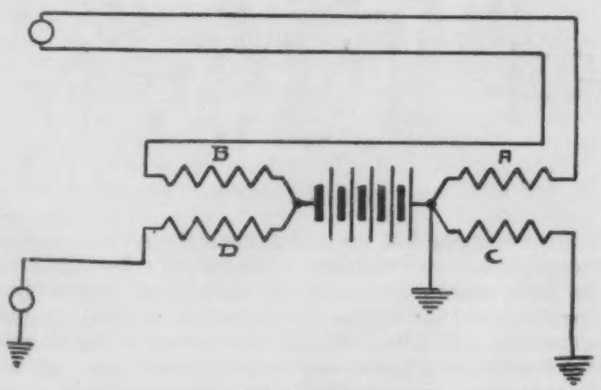


FIG. 2.

represented by dotted lines, as section 5 and 6. Tip eighth, winding 1 of the metallic side, and the dotted tip eighth, winding 5 of the grounded side, start out in pairs at the same end of the core. Likewise, the metallic ring eighth 3 starts out in pairs with grounded ring eighth 7. On the other side of the core, or end, a double transposition takes place, as 8, the grounded ring eighth, pairs with 2, the metallic tip eighth, while 4, the metallic ring eighth, pairs with dotted grounded tip eighth 6.

The balancing effect may be better shown by Fig. 4, in which the various sections are connected in circuit. As connection with a grounded line renders the grounded tip quarter useless, it will not be shown. An inspection shows that grounded rings 7 and 8 have equal loading effects on each end of the core. By transposition, winding 7 affects the ring side of the circuit at 3, exactly as 8 affects the tip side at 2. Therefore, each quarter of the coil on the metallic side presents equal resistance to the alternating static charges.

There has been considerable conjecture among licensee employes as to the reason that the improved eight-section coil will not permit of a ground at the arrester frame, or shortcircuiting of the grounded tip quarter, as did the older four-section type. When a coil gets down on a metallic circuit, the transmission is muffled to a serious degree, when the eight-section coil is used. The reason would be that the old coil had two separate magnetic fields, one of which could be shortcircuited or idle without affecting the other. In the

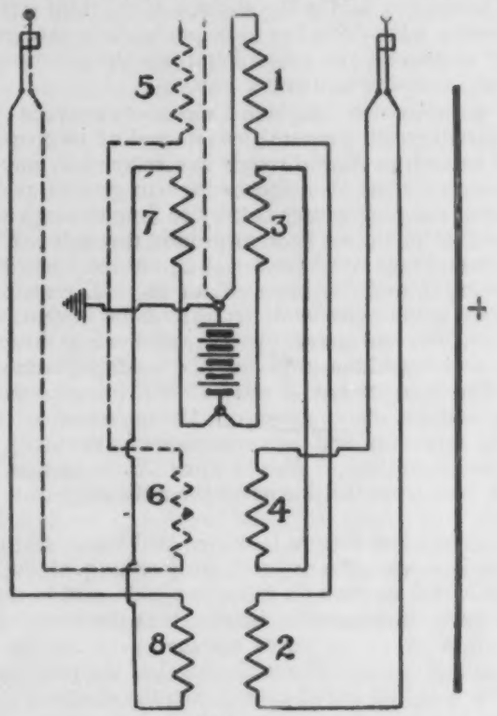


FIG. 4.

newer coil, a shortcircuited quarter would affect the entire core, and render it non-inductive, and not efficient as a repeater.

As a non-inductive relay appeared in the Dunbar circuit, nothing yet appears of a revolutionary nature. The series grounded local battery system had a winding in the circuit as a clearing-out signal, through which the voice currents passed. The lieensee system has a clearing-out signal through which the voice currents pass. So has the Dunbar original system. What is the difference? The licensee non-inductive supervisory relay has two windings, eleven ohms of copper, and one hundred ohms of German silver wire, wound on the exterior of the copper winding, of few turns, and having no inductive value. The 100-ohm shunt did not materially weaken the power of the 11-ohm copper winding in connection with its direct-current functions, but when in the path of voice currents, acts as a direct circuit without any magnetic energy being set up, and consequently does not affect the rapidly changing frequencies to their disadvantage. The non-inductive relay of the Dunbar system is a differential relay, having two windings of equal and opposite value, and having the same relation to the core. If the coils were wound on the respective ends of the core, lines of force would be set up in the respective ends of the core of opposite value, and neutralization would take place. But when alternating currents of extremely high frequency pass through these windings a neutralization would tend to take place, but does not, because the lines of force do not have time to thread through the neighboring coil; hence energy is restored to the circuit, which makes the end-on relay inductive

to a certain extent. To cause complete neutralization, it must be done electrically, and not through magnetic means. If the coils are superimposed upon each other, then a neutralization takes place between the forces tending the produce magnetic energy, thus killing the evil at its inception.

What is the difference then, between the Dunbar and the licensee systems, if each makes use of a cut-off relay, a repeating coil, and a non-inductive cord relay? There is a great difference in the electrical actions involved, necessitated by the use of a talking strand as the means of operating the cut-off relay, and acting as a test terminal, in addition to its natural function. And in the absence of the third strand, the act of testing a busy line has to be particularly safe-guarded, in order to prevent the subscriber from being seriously annoyed while talking to another party.

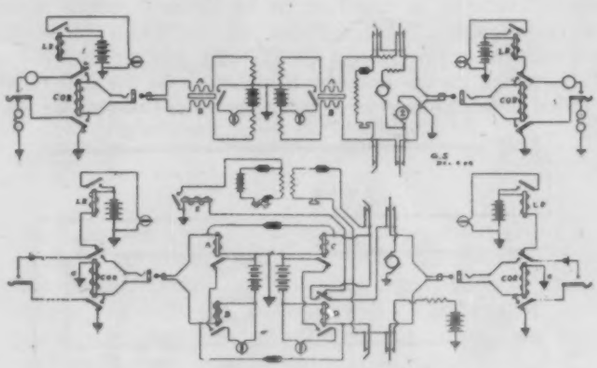
Fig. 5 shows the original Dunbar two-strand system. The subscriber called central by removal of receiver, which allowed battery to flow through line relay, *LR*, out on the line through contact at *a*, thence back to ground at *b*. The entrance of the plug causes battery to flow through winding *B*, relay *C O R*, thence back to ground through winding *A*. The current being equal in *A* and *B*, the relay has no magnetic strength, and the lamp circuit of *A L* remains open. Right here is the remarkable feature of the system, that the cut-off relay is energized by current flowing through the talking circuit, without impairing the talking qualities in the least. The energization of relay *C O R* brings out another original feature, the simultaneous disconnection of the line signaling apparatus, and the connection of a normally disconnected multiple jack. This normal disconnection of the multiple jack from the line gives the advantage of a reliable busy test.

Another marked feature is shown in the busy test method. The test is a natural one, and the touching of the calling cord tip to the sleeve of a busy line jack, and is similar to that of the licensee systems, inasmuch as the touching of the tip to the busy sleeve stores up energy in the tip quarter of the repeating coil. The withdrawal of the plug tip causes a discharge of this stored energy into the operator's bridged receiver, and into the circuit of the calling party. But the Dunbar subscriber would be painfully aware of the test being made, while the three-strand licensee subscriber would not. The touching of the grounded tip to the sleeve talking terminal would materially lower the potential of the terminal, and cause a vicious receiver click in both talking lines. To prevent this click, the listening key is arranged so that its use will remove a shortcircuit from about the 700-ohm resistance placed directly in the testing circuit. This modifies the testing click in the subscribers' receivers considerably. There might be an objection to this method, as it introduces a 700-ohm resistance in the talking circuit of two connected parties, should the operator listen in. As she has double supervision, there is no reason why she should do so.

Inserting the calling plug lights the supervisory lamp, because the low resistance ground on the sleeve line side unbalances the differential windings and causes magnetic energy to be operative on the relay armature. More current will flow through *B'* than through *A'*, until the ground is removed by the subscriber removing the receiver. Then the windings neutralize, and the lamp is extinguished.

Another marked feature is the necessity of a temporary source of energy to hold the cut-off relay during the act of ringing. As the multiple is normally disconnected from the line, and its connection with the line depends upon the energization of the cut-off relay, and the energization of the cut-off relay depends upon current flowing over the cord circuit, it follows that the necessary opening of the cord circuit in the act of ringing shall not deprive the cut-off relay of energy. This was accomplished by means of an alternating current generator, which was connected to the sleeve side only. A direct current generator was bridged across the circuit, and supplied the cut-off relay with direct current. Later, it was found that the ordinary exchange battery connected to the tip side through a suitable impedance would accomplish the same purpose as the direct-current generator. The idea is shown in Fig. 6, a later circuit, which supplied generator current out on the tip side, while the main exchange battery supplied energy to the cut-off relay.

At this stage the Independent designers made a revolutionary move. They departed from the repeating coil, they departed from the non-inductive relay, the only semblance being in the cut-off relay principle, though utterly unlike in operation. The era of double disconnect retardation system began. What were the technical reasons why the differential system, with its repeating coil, its non-inductive relay, and ground at the subscriber's station should be relegated, and the retardation system made standard? Both are designed for metallic service exclusively. The principal weakness was in the ground at the subscriber's station, which is objectionable for many reasons. The difficulty of a fair ground for selective ringing is known, while this system had to have a good ground, a real ground, of lowest possible resistance, in order that the differential relay could be reliably operated. Supposing the grounds to be perfect, another difficulty presents itself—that unrelenting enemy of grounded telephone practice—earth currents due to the street railway companies. Potentials of different values exist on every line, making the operation of the differential relay a great uncertainty. And its peculiar dependence upon its external connections as a switchboard makes it unique, though not a weakness.



FIGS. 5 AND 6.

When the ground at the subscriber's station was changed to the ground at one terminal of the cut-off relay, *G*, in Fig. 6, the differential relay had to be abandoned, because there is no possible way that a neutralization could take place between *A* and *B*, when the subscriber removed the receiver. The 500-ohm cut-off relay would shortcircuit winding *A* to a certain extent. So windings *A* and *B* were placed on separate cores, as it were, *B* being the winding of a back contact relay, while *A* is the winding of make contact relay. When a party calls in the usual manner, the operator would insert the plug, which would put relay *A* in series with cut-off relay *C O R*. Both would be energized, *C O R* cutting off line signaling apparatus, and connecting the multiple to the line, while relay *A* closed the circuit of the supervisory lamp. As the receiver is supposed to be off the hook, *B* is energized, and the lamp circuit broken.

The test feature is a distinctive one, consisting of a 5,000-ohm relay, which armature contacts, when closed, put a ground on the primary circuit in such a manner as to cause a battery flow through the primary winding, and induce a current in the secondary. Being of a great number of turns, and highly inductive, it does not cause an appreciable reduction of the terminal potential, and only an experienced telephone user can detect the test made on his line. The

testing relay serves the entire operator's position, and is necessarily disassociated from each talking connection. Relay *D*, acting in series with the cut-off relay, *C'O'R'*, serves this purpose, and also closes the talking circuit, and the supervisory lamp circuit also. When the subscriber answers, relay *C* has a function liken to relay *B*, simply opening the supervisory lamp circuit.

Condensers connect the answering and calling circuits instead of repeating coils, and serve to repeat the fluctuating voice currents. The circuits are individualized by the relays, which also control the direct-current supply as well. The circuits in Figs. 5 and 6 bear a very close resemblance to each other, having the same features practically, first, the temporary energization of the cut-off relay during the act of ringing, second, the current of cut-off relay energization being supplied over the strands of the talking circuit, and third, the combined use of the sleeve as a testing and talking terminal.

Both systems have a normally disconnected multiple jack, a normally connected line-signaling apparatus, are designed for metallic service only, and it may be said that the four years' effort of the brainiest, cleverest, and most experienced telephone engineers ever assembled together in the employment of one company simply resulted in the removal of the ground from the subscribers' station to that of the ground at the exchange cut-off relay terminal, which fact strongly proves the genius of the inventor of the first double supervisory two-strand telephone system. And when one remembers the herculean difficulties confronting this, and other groups of Independent telephone engineers, the limited experience of the past, working in an entirely new field of action, one cannot help but realize that this apparently simple transfer of grounds represents many mile posts in the advance of telephone development.

OFFICERS OF THE NATIONAL ASSOCIATION.

James B. Hoge of Cleveland, Ohio, the newly elected president of the National Independent Telephone Association, has opened up headquarters in his home city, and is actively engaged in pushing the work of organization and strengthening the association. President Hoge's capacity as a worker is well known, and when the statement is made that he is bending every effort in behalf of the association, the success of the national body is assured and the great work which it has set out to accomplish will be completed in due time and the national body made the greatest organization of its kind in existence. Literature is being sent out to exchange managers and Independent workers in all parts of the country as one of the means of furthering the plan of organization outlined at St. Louis, and the hundreds of favorable responses that have poured in on President Hoge have confirmed his belief that Independents everywhere but await the suggestion to rally to the undivided support of the national association.

In thus referring to President Hoge it may not be out of place to append a brief sketch of his life. James B. Hoge was born near Flushing, Belmont county, Ohio, December 20, 1866, a son of Byron M. Hoge and Tamzen L. (Merritt) Hoge, respected members of that community. He spent his early life upon his father's farm, where his father still resides, his mother being deceased. The Hoge family trace their ancestry back to a long line of sturdy Scots, and the first of the family came to America as early as 1650 and settled in Virginia, the family coming to Ohio in the latter part of the seventeenth century. It was in the country school near Flushing that Mr. Hoge secured his early education. When sixteen years of age he took up the study of book-keeping, telegraph operating and other railroad work, employing his services, when possible, at delivering messages for the Western Union Telegraph Company at Flushing. When eighteen years of age he accepted a position as night telegraph operator for the Cleveland, Lorain & Wheeling Railroad at Bridgeport, Ohio. The next two years he occupied various positions with the Cleveland, Lorain & Wheeling Railroad and its allied interests.

In 1888 Mr. Hoge was transferred to Lorain as chief clerk for the Cleveland, Lorain & Wheeling and Nickle Plate railroads, which position he filled for nearly three years, when he retired from the railroad business and organized the Lorain Savings and Banking Company, of which he became secretary and treasurer. In 1894 he was elected secretary of the Lorain Chamber of Commerce. During that year arrangements were made for the Johnson Steel Company to move the works from Johnstown, Pennsylvania, to Lorain. The Chamber of Commerce negotiated a number of improvements for the city, and among other things undertaken was that of securing a telephone company for the thriving village, then having a population of about 6,000. The Bell company refused to build an exchange unless it was guaranteed fifty subscribers at $54 per year. Although the basic patents had not yet expired, the subject of this sketch organized a syndicate to build an exchange, and placed it in operation before the close of that year. At the present time this exchange has over 1,600 subscribers and the Bell has less than fifteen telephones in the city!

While secretary of the Lorain Savings and Banking Company Mr. Hoge became connected with the Everett-Moore syndicate. The head of that organization, recognizing his ability, in 1898 made him secretary of the United States Telephone Company, when he moved to Cleveland, resigning his position in the bank he had organized and made a prosperous institution. He still holds the position of secretary of the United States Telephone Company, and also vice president of the Federal Telephone Company, to which position he was chosen later on.

Associated with Mr. Hoge as officials of the National Independent Telephone Association of America are four of the most prominent and most influential Independent telephone workers in the United States—Breckenbridge Jones, Missouri, first vice-president; Senator William Flynn, Pennsylvania, second vice-president; Col. A. L. Têtu, Kentucky, secretary; Hon. Hugh Dougherty, Indiana, treasurer.

Breckenbridge Jones is treasurer of the Kinloch Telephone Company of St. Louis and is also at the head of the Mississippi Valley Trust Company. For a long time he was chairman of the trust company section of the American Bankers' Association. He is a leader among Independent telephone workers.

Hon. Hugh Dougherty, the retiring president, is one of the best known men in the Independent field and a recognized power in the movement. He has done much to build up the national association and may be depended upon to do still more in the future. He recently was elected to the presidency of the Marion Trust Company of Indianapolis.

Senator William Flynn is one of the largest holders of Independent securities in the east, and is a man of national reputation, being famed in telephone circles as an organizer. For years he has been a prominent figure in the politics of his state, and has also been active in the management of steam and electric railways, gas and other public-serving corporations in the east.

Col. A. L. Têtu is general manager of the Home Telephone Company of Louisville, Kentucky, and one of the most widely known men in Independent circles, being a familiar figure at nearly every Independent convention, large and small, state and national. He is recognized as one of the best operating men in the telephone field, has had broad experience, and his advice in the management of the national association will be invaluable.

DIGEST OF TELEPHONE PATENTS

Conducted by Edward E. Clement

770,268—W. M. Davis. Telephone Exchange System.

This is a signal scheme for toll board connections. The calling subscriber controls his line signal on the main operating board and also controls a supervisory signal before the toll board operator. The called subscriber on a toll line controls a clearing out signal on the toll board, and when the toll operator, who supervises the connection, gets both signals she breaks the connection and thereby signals the subscriber's operator for disconnection.

In the diagram, suppose station *90* on a common battery exchange desires to call station *120* on a toll line. Subscriber's operator *A* gets the line signal *14* and trunks the call by means of an ordinary pair of plugs *17-18*, over trunk line *C* to the toll board *B*, whereon the apparatus is of the magneto type. The *A* operator's cord circuit has the usual supervisory relays *20* and *21*, and lamps *24* and *25*, the local circuits of the latter being completed through the tips of the plugs and the line or trunk battery connections. In a connection, therefore, the calling subscriber controls the supervisory lamp *24*, through its relay *20*, while the lamp *25* is controlled by the toll operator through its local circuit at spring *37* moved between local contacts when the plug *26* is inserted and withdrawn. This spring is normally up against upper contact connected through lamp *38* to battery *39*, whereby an advance signal is given to the toll operator when plug *18* is inserted in the trunk jack *33* by the *A* operator. When the toll board plug *26* is in the jack *34* spring *37* is pushed down and cuts off lamp *38*, cutting in relay *41* of 1,000 ohms' resistance across the trunk. This relay controls lamp *42* in a local circuit on battery *30*, and derives its current from the bridged battery *15*. While subscriber *90* has his telephone off the hook the relay *41* is shunted, but when he hangs up the shunt is broken, relay *41* pulls up and lights lamp *42*. The toll station *120* controls the clearing out signal *29* by magneto current, and when both these signals are received, toll operator *B* clears out, whereupon spring *37* closes circuit of lamp *25* and the *A* operator then clears out, having already received the signal from station *90* by lamp *24*. Probably through a draftsman's error the batteries *15* and *39* are apparently opposed.

The patent is assigned to the Stromberg-Carlson Company.

770,269—W. M. Davis. Telephone Exchange System.

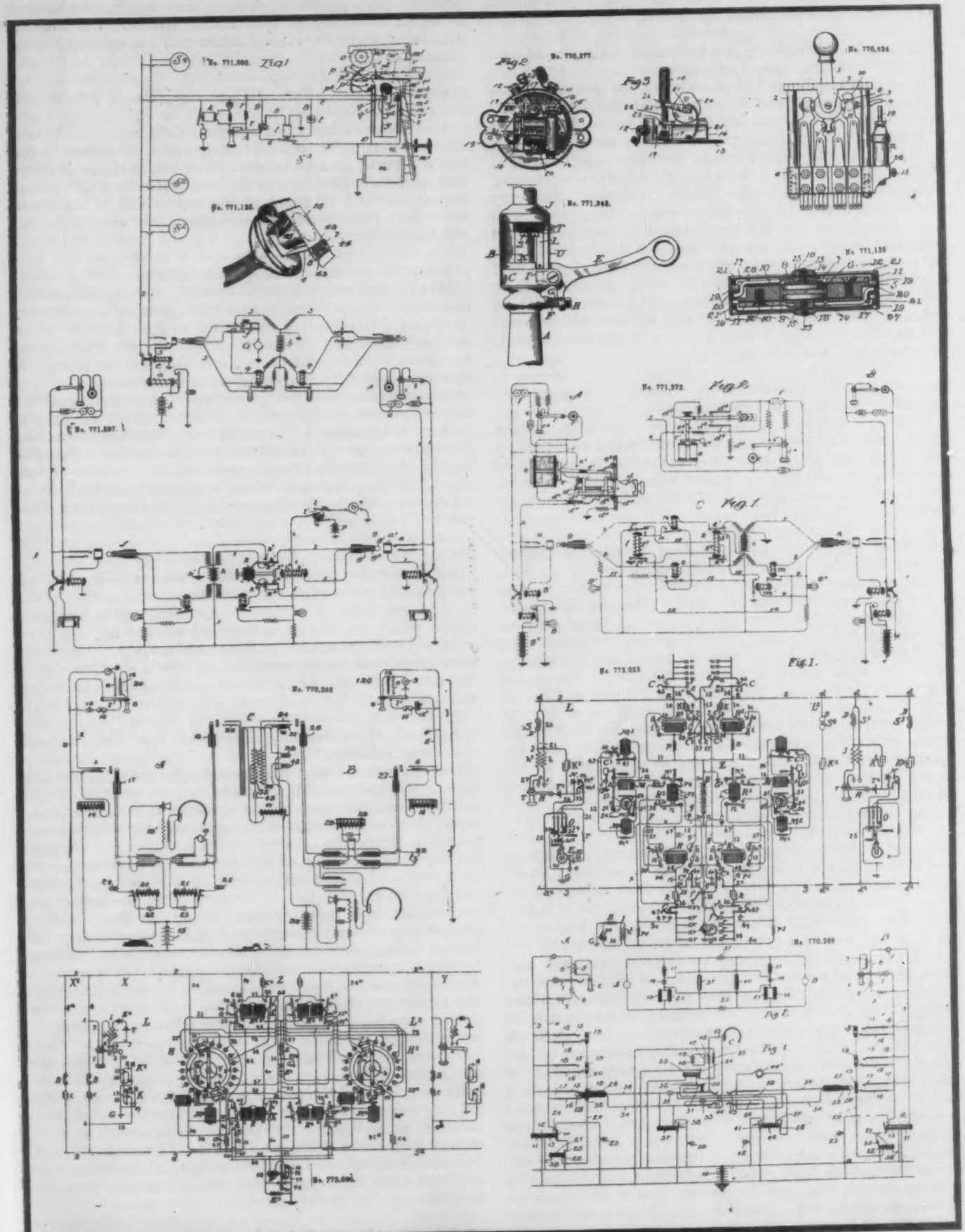
This is a common battery exchange system intended to be "clickless." The windings of the line relay *12* are divided at *11-13*, each half being in one side of the line. The cut-off relay *21* is in an open shunt of winding *13*, closed when a plug is inserted by the sleeve of the latter crossing together the jack thimble *19* and line spring *16*. The cut-off relay breaks the local circuit of the line lamp *25*. The supervisory relays *37* and *40* are bridged across the two ends of the cord, and are shunted by the respective subscribers' lines when in use. The resistance of the various windings are as follows: Winding *11*, 200 ohms; windings *13* and *21*, each 400 ohms; winding *37*, 800 ohms. The listening key springs *44* when operated bridge the operator's telephone *C* across the answering end of the cord *30-34*, and connect a test relay *53* to the tip of *29* of the calling plug. This test relay when energized closes tertiary winding *55* in operator's induction coil to produce a click. It will be energized if the test circuit is completed either through the line if subscriber's telephone is down, or through another cord conductor *34* if a plug is in at another section. Supervisory relay *40* has two armatures, *41* requiring strong current to pull it up, and *56* responding to weak current. The latter closes a bypath around the listening key contacts *51*, so that in listening-in after completing the connection the operator will not break the talking circuit. This remains up throughout a connection, but armature *41* is released when current in the relay *40* is cut down by the wanted subscriber answering and so closing the line shunt around the relay. The operation of this relay *40* would apparently make necessary some rather nice adjustments, since it works on such a narrow margin. Both armatures being once attracted, armature *41* must be released on weakening of the current and consequent diminished magnetization of the core, while armature *56* must be held thereby. With lines of various resistances it would appear to be difficult to make this relay reliable.

770,296—I. Kitsee. Telephonic Relay.

This is a telephone relay involving the principle of a pole changer. It comprises a pair of magnet poles with a polarized steel tongue between them, carbon or other resistance being interposed between the tongue and each magnet pole. The windings of the two magnets are in series but in reversed relation, so that a current pulsation which makes one pole N. makes the other pole S. A double effect is thus produced on the tongue, which oscillates between the poles, each single movement increasing the resistance on one side and correspondingly decreasing it on the other. The tongue is connected in parallel between two batteries and two primary windings whose opposite ends are connected to the two magnet poles respectively. A common secondary winding is connected to line. Each movement of the tongue produces a fall of current in one primary and a rise in the other. The connection with relation to the secondary being opposite, these effects are cumulative, combining to send a supposedly doubled impulse to line.

770,377—G. A. Long. Register and Alarm Mechanism for Telephone Toll Apparatus.

This patent, which is assigned to the Gray Telephone Pay-Station Company of Hartford, Connecticut, covers a very ingenious and compact form of register and signal which may be applied to any telephone. The whole contrivance is contained in a little cylindrical box smaller than a watch case receiver, having ears by which it can be screwed on to a backboard or the base of a desk set. The apparatus is simple, comprising a cyclometer register with a side lever *22*, a buzzer, and a push button to close the circuit of the latter and simultaneously work the lever of the register. The terminal binding posts are connected across the line posts on the telephone so as to bring the register in parallel with the subscriber's set. When the operator gets the connection wanted she says "push your button," and



this when done works the buzzer and registers the call. The operator of course hears the buzzer.

770,410—C. D. Wright. Detachable and Antiseptic Mouth-Piece for Telephone Transmitters.

I have several times had occasion to use the public telephone at a hospital, and in at least one case I knew positively that the instrument had been used within five minutes by a consumptive patient, and probably by many others. It is said that all of us carry within us a certain percentage of noxious germs, but the mere thought of the concentrated affluvium in that particular White transmitter made me wish fervently that I had some device like the present with me. This invention of Mr. Wright's is merely an open paper funnel with side clips to permit a rubber band to be stretched around the mouth-piece and over the clips to hold the funnel in place. A wide circular flange is intended to be used for advertising. I prefer a funnel closed at its lower end with some thin material, but this device could be made that way just as well. Who will invent the perfect transmitter, which will not look so dirty?

770,424—Lars Magnus Ericsson. Switch or Ringing Key for Telephone Switchboards.

This is a listening and ringing key provided with a spring plunger on the ringing side, the plunger acting like a dash pot so that when the lever *5* is thrown to the right to ring the spindle *19* of the plunger will be forced down by arm *9* and will act slowly to return the same and cut off the generator.

770,556—J. A. Brown. Single Wire Selective Signaling and Intercommunicating Telephone.

This is a step-by-step party line selective system having all the stations in series on one wire. When out of service, only the selective magnets are cut in and these selective magnets control individual ratchet wheels, as usual, each wheel revolving a dial upon which is a fixed pin corresponding to the home station and a movable pin for the station called. The wheels all being at zero it takes a different number of impulses to step around the fixed pin at any one station so that it will lift a lever to close the local circuit of the bell. When in use, the telephone receiver and the secondary of the induction coil are in series with a condenser, so that no direct current can be sent over the line when already in use. Local batteries are used for both talking and signaling, in separate sets.

771,114—A. K. Andriano and H. Herbstritt. Switching Mechanism for Intercommunicating Telephone Lines.

This patent is assigned to the Direct Line General Telephone Company of San Francisco, California. It is impossible to see where the direct line comes in the patent. If the language of the description is to be taken literally this is an intercommunicating system having the main cable carried around to all the stations as usual, and in addition to the ordinary ten-point switch, a real switchboard is provided having tilting rocker arms each carrying the terminals of the taps from a given group of the lines, say ten. Each set of terminals is adapted to be brought into connection on one side with the ten terminals of the ten-point switch. In other words, there are only ten points in the selecting switch on the telephone, but there are two push buttons in addition, one of which puts the switch onto the second ten wires of the system, and the other puts it onto the third ten, at the same time cutting off the first ten to which the switch is normally connected. Each push button controls a magnet which controls a rocker arm bearing the terminals of its appropriate ten. The only trouble with this system is that it adds so much apparatus. Engineers have not considered it to be good practice to use intercommunicating systems with a greater number of lines than can be handled by direct switching at each instrument, and the addition of a switchboard for each instrument is a considerable complication.

771,128—H. L. Cutter. Hygienic Appliance for Mouthpieces.

Mr. Cutter is from Los Angeles, California, and his device has a familiar look. It comprises a bent sheet metal holder secured on a transmitter by screwing the mouthpiece into place through a hole in the back plate, the holder carrying a little roll of paper at the top, which is fed down across the mouthpiece and through a clip and cutter below it.

771,135—E. B. Fahnestock. Microphone.

Mr. Fahnestock is from New York, and his "edgewise" transmitter is quite well known. His present improvement comprises a block with a round hole in the middle in which the two electrodes face each other, supported by elastic diaphragms *10* secured on opposite faces of the block. A main diaphragm *17* is secured at its center outside of each of these diaphragms, and is unsupported at its edges, but has all around its periphery a filling of elastic cement *21*, such as rubber cement. The idea is to prevent the air waves from passing around behind the main diaphragm. By placing the block horizontally the same end is attained by forming a drop flange around the diaphragm and having it dip in a mercury seal which will permit it to vibrate without passing the "air-waves."

771,343—K. Weman. Telephone.

This is another New York man, a subject of the king of Sweden. The invention is a desk set switch-hook. On top of the desk stand *A* a hollow cylindrical cap is mounted, within which the contact springs are secured by bent over ends screwed up against a flange on the top. The hook lever is pivoted on the outside and has a stud extending through a hole into the cylinder to work against one of the springs.

771,548—E. K. Hertford. Telephone Call Register and Time Indicator.

One of these registers is supposed to be provided for each section of a switchboard, for registering the number of calls and the time consumed by the operator in making connections "thereby enabling the management of a telephone exchange to figure the efficiency of an operator and ascertain the degree of perfection of the service." A time mechanism is started the instant a call is made as indicated by the pilot and line lamps, and this is arrested when the call is answered; each call is registered; and the "manager or official" superintending the operators may observe the time from a distant point, "it being the purpose of this invention to have the mechanism connected electrically in series with the conductors for supplying electricity to the lights *x x x* and to the receiver of the operator." The apparatus described apparently consists of an aggregation of dial registers arranged around a large disk having a central clock movement. Controlling magnets are in circuit with the pilot lamps, and these in turn with the chief operator's or monitor's pilot lamps. Current in the pilot lamp circuit works the magnets to register on units, tens, hundreds and thousands dials, and starts the "timing movement," which is stopped by a brake when the subscriber's operator plugs in. The total time indicated divided by the total number of calls indicated gives the average time per call, which determines the "efficiency" of the operator.

771,853—H. Abbott. Telephone Call Recorder.

This is a call register to be placed at the subscriber's sta-

tion and which gives a printed record showing the total number of calls for a particular period of time. A set of geared spindles for units, tens, hundreds and thousands are worked as usual through the units spindle by an electromagnet which may be in the talking circuit of the subscriber. On the end of each spindle is an arrow, turning within a ring bearing numerals from zero to nine and reversed from normal. The arrow and numerals constitute type faces, and above this set is a fixed type unit bearing the number of the instrument. Mounted within the casing and across the type faces is a printing platen and between it and the type a card is inserted which is allowed to remain for a certain period, the time of insertion being noted. When the box is unlocked the key in turning forces the platen and its card against the type and an imprint is thus obtained of the number of the station and the number of calls, the latter indicated by the arrow heads pointing to the numerals to which they have been turned, as in ordinary time stamps.

771,897—W. W. Dean. Call Signal Apparatus for Telephone Exchanges.

This patent is assigned to the Western Electric Company, and covers an automatic ringing key controlled, after setting, by the called subscriber. The ringing key is provided with an electromagnet *i* having two windings i' and i^2. When the calling plug is inserted i' gets current over the cut-off relay circuit and the magnet is energized to hold down the key, whose lever sticks to its pole. Ringing current from generator *o* and battery current are fed to line alternately through the commutator *1*, wire *6*, and winding i^2 of the key magnet. As long as the subscriber's telephone is on the hook the winding i^2 produces no effect, but when the subscriber answers, a low resistance path through his talking set is closed, and coil i^2 neutralizes the effect of coil i' and releases the key.

771,917—R. L. DeMoura. Wave Transmitter.

While this is a wireless telegraph transmitter it embodies telephonic principles to a certain extent. A make and break transmitter is energized by the voice and sets up distance pulses in the primary of a coil whose secondary is connected to a high power coil having its secondary connected to the radiating wire or body. At the receiving station a selenium cell is affected by flickerings in a lamp in the circuit, whereby the fundamental tones may be detected in a telephone receiver, according to the inventor. He uses these tones in a code, stating that even many words can be recognized.

771,946—F. W. St. John. Means for Supporting Telephone Receivers.

This is a receiver holder which maintains the instrument at the ear a fixed distance from the transmitter. A swinging arm carries a screw clamp at its outer end for the receiver and has its inner end mounted on a rock shaft coming out through the side of a casing set on the backboard over the transmitter arm. A finger on the rock shaft works a switch for the talking and signaling circuit.

771,920—F. R. McBerty. Coin Collector.

The purposes of this invention are as follows: Coins under the required size are immediately rejected and passed back to the depositor through the return-chute. If the coin is of the right size and the system is otherwise in operative condition, the coin will be transferred to a temporary receiver where it is held until finally disposed of, and in the meantime if another coin is deposited while the first is undisposed of such other coin will be immediately refunded through the return-chute. A deposited coin will also be immediately refunded if the telephone line is already in use at some other station, assuming it to be a party-line. If the circuit of the line is broken, so that the central office cannot be signaled, the coin may be recovered by the subscriber by pressing a button. The final deposit of the coin in the cash-box may be brought about by the operator pressing a key at the central office, or under proper circumstances the subscriber may recover the coin by pressing a button after the connection at the central office has been taken down, the premature or fraudulent recovery of the coin being, however, prevented.

The system of wiring employed is not claimed in the present case (which is assigned to the Western Electric Company), and the invention relates to the mechanism entirely. Coins are inserted through a vertical slot at the top of the box and fall down between a pair of stops. Undersized coins go on through into the return chute and come out again. Proper sized coins stop, and as the stops are arranged to clip a coin on the edges below the center of gravity, it will turn completely over, this being assisted by an edged partition to one side of the stops. The coin somersaults over this partition into a temporary carrier having side lugs or guides between which it rests supported on a stop carried by a magnet-armature controlled from central. The temporary holder is normally held in a neutral position, and if the magnet is energized to withdraw its stop the coin will fall in the till; but if not a plunger may be pushed in by the subscriber, causing a pin to ride over a cam face on the temporary carrier to push the same back so that the coin will ride off its stops and fall into the return chute to come out of the box. The plunger cannot be pushed in if the magnet is energized because the armature of the latter carries a pin which works in a cam slot in the plunger bar. Neither can the plunger be pushed in quickly before the magnet has time to pull up, because the cam slot forces the armature up close to the magnet in its movement, so if there is any current it will hold up.

The reason for making the coin turn a somersault is that otherwise coins with a string to them might be used, but this makes that method of beating the machine more difficult.

771,972—W. W. Dean. Telephone Toll Line System.

This is a toll line scheme comprising a blocking device at the toll station which prevents the use of the line, after a desired connection has been obtained, until the user has deposited the required coin. The call is made in the usual way, and the circuits are standard Bell relay circuits. To close the calling circuit a coin is inserted in a slide, but not deposited. When the called subscriber answers his supervisory relay works a pole changer in the cord circuit to cut back reversed current to the calling station, which throws over the armature of a polarized magnet and short-circuits the talking set. This can only be restored by pushing in and depositing the coin.

In the drawing (Fig. 1) the coin *d* is first put in the slide to push back the plunger and close circuit at d'. The slide cannot be pushed in because the armature e' of polarized magnet *e* normally stands as shown with its arm blocking the slide. Answer having been made, and the connection set up, the wanted subscriber is rung, and when he answers, his supervisory relay *m* pulls up as usual, relay m' gets current, and this closes circuit from ground through winding k^3 of relay *k*, which pulls up reversing the battery on conductor *7* through armature k' and through the magnet *e* at station *A*. The magnet reverses its armature, which unlocks the slide, shows a signal at e^2, and closes at e^3 a shunt *5* around the transmitter and receiver. The subscriber at the toll station, therefore, cannot talk until he has pushed in his slide. When this is done the contacts d^2-d^3 are opened by cam d^4, magnet *e* reverses, central relay *o* lets go, circuit *12* of relay *1* is closed, and this cuts off the relay *k*, whereupon

the battery connections are restored, and the lines are clear for conversation.

771,996—F. R. McBerty and J. L. McQuarrie. Measured Service System for Telephone Exchanges.

Telephone toll stations or subscribers' stations having measured service are usually handled upon one of two plans. Either a coin is deposited at the time each call is made, or each call is registered and the company collects the total amount due in a lump. This patentee says it frequently happens that some lines in an exchange will be equipped with call registers while others may have coin collectors, and the lines may be indiscriminately grouped on the switchboard. The operator must then distinguish between the lines in order to handle them properly. The object of the present invention is to provide a register that will work the same as a coin-collecting device, so far as the operator is concerned, and which may be used on a party line also.

The register apparatus is at the substation, and the general scheme is to have the call provisionally recorded by a suitable magnet as soon as the telephone is taken down. If for any reason central cannot be gotten, the subscriber hangs up and pulls a lever which cancels or rebates the call. If the connections to central are all right, however, but the line happens to be a party line and is in use, a test relay at the substation cuts off the register magnet. If the line is not in use the same current which works the line relay at central sets the register magnet. The subscriber can still, however, hang up and cancel the call. After the operator has plugged in this becomes impossible and thenceforth the registration is controlled by the operator.

In the diagram *m* is the register magnet, *o* the register mechanism operated thereby through the pawl lever m^2, *1* is the test relay, and *w* is the rebate or canceling lever whose handle lies outside the register box. When the subscriber calls, his hook lever *h* puts the test relay *1* on line wire *2*. If busy, the test relay gets current and disconnects the relay *m*. Hence no call is charged. If not busy, the relay *m* gets current through *1-7-6-5*-ground, from battery *b*. This pulls up the armature *m'* but does not fully register. It does drop a target *p*, showing the subscriber his call is in, and contacts *q-q'* and *z-z'* are closed so that magnet *m* is to line no matter how the lever *w* is worked. When the operator plugs in, battery to line is reversed and bridged. If the connection wanted cannot be obtained the operator tells the subscriber to hang up and pull his lever. When he hangs up she pulls out the plug and he rebates the call, thereby resetting the target *p*. If the connection is obtained, the operator presses her key *f* after both subscribers have finally hung up, which puts generator *G* to both sides of line and causes magnet *m* to fully pull up, registering the call and restoring the target *p*.

772,023—A. M. Bullard and L. A. Falk. Automatic Telephone Exchange System and Apparatus.

This is a common battery automatic exchange system constituting an improvement on that for which letters patent No. 709,740 were issued to Bullard and Rorty September 23, 1902. The earlier system also showed a party line arrangement with common batteries for talking, but had magneto generators at the substations for signaling. Generally stated the distinguishing features of the present system are as follows: When idle, the substation talking apparatus is disconnected and the ringer connected with a condenser as usual. When two lines are connected the main battery is bridged at central to both sides of two condensers, with the operating relays, serving as impedance coils, in the bridge arms. The substation talking sets are then connected as in the standard Bell circuits.

The switch employed in this case for selecting comprises a nearly complete circle with radial contacts and an arm which is stepped all around the circle apparently by single steps, up to 100; and in fact the system described is apparently limited to 100 lines or less. In operation the subscriber first takes his telephone off the hook, then works his selector transmitter, which breaks the metallic circuit and sends current impulses over one side thereof. The main battery being bridged at central, and having one side grounded, the relay in the bridge on the live side responds to the impulses to open and close local circuits of the selecting magnet, a detent magnet, and a connecting magnet. The switch arm is first stepped around, the switch terminal comes over the multiple terminal of the line wanted, a test relay is thereby connected and if the line wanted is busy, cuts off the operating magnets and connects back a busy tone test to the calling line. If the line wanted is not busy and the connection is completed the calling subscriber rings by means of a push button which again severs the metallic circuit and steadily closes the same side of line which was used for selecting, with the result that the selecting relay pulls up, while the ringing relay in the bridge on the other side of the battery lets go its armature; and by the combined action of these two relays the generator is connected to the switch terminal and thence to the wanted line. Code signals are employed, different stations on a party line being signaled by pressing the push button different numbers of times.

In the drawing herewith four subscribers' stations are indicated, one *S* being on a private line *L* and the other three S^3, S^4, S^5, being on a common party line. *S* is supposed to be calling and has selected station S^3, and is about to ring. The contacts j-j^2 should be shown touching the hook levers instead of up in the air as at present. *E* is the impulse transmitter. *N* is the ringing key. The main battery *B* is bridged across each metallic circuit permanently by the path *10, p, 20, B, 12, R, 13*. *R* is the selecting relay, and *R2* is the ringing relay. The armature *c* of the latter must be back as shown, and the armature *b* of the former must be drawn up by pressing the button *N*, in order to connect the ringing generator *P* to the selective terminal *e* and so to the wanted line wire *2*. *R3* is the test relay, which, if a line is busy breaks the contact *8* to cut off the stepping magnet *M* and the connecting magnet *M3*, and closes the contact *43* to put the buzzer *P2* to wire *3* of line calling through the path *x*.

772,024—A. M. Bullard and L. A. Falk. Automatic Telephone Exchange System and Apparatus.

This system is designed for small exchanges of ten lines or less, and uses common battery for operating the switches and for ringing, local batteries being used for talking. Primary cells instead of storage batteries are employed at central. At the sub-station the usual high resistance call bell and condenser are provided, together with a telephone set, a selecting key, and a ringing key, each adapted to ground one side of the line. At central each side of the line goes through a polarized relay to the battery, one of these being the selecting relay and the other the ringing relay. The selector switch has two electromagnets, one, the selecting magnet operated only when the selecting relay is inert and the ringing relay excited, thus economizing current; and the other the retaining pawl magnet adapted to attract its armature as long as either of the line relays is excited. The selector magnet rotates selector springs step by step against the tension of a return spring around a dial carrying terminal contact plates or multiples of the lines, the selector arms serving to cross these with segments connected to the line of the switch. After the selector has been operated, the signal key is pressed a number of times corresponding by code to the wanted station, and a pulsating ringing current is thus sent over a grounded circuit to

the bell of the called line. When the calling subscriber's telephone is hung up the line is opened, and the switch is automatically returned to zero. In the drawing *K* is the selecting key and *K2* is the ringing key. At central, *H* is the switch, *M* is the selecting magnet and *M2* is the ringing magnet. *R* is the selecting relay and *R2* is the ringing relay. The general operation is similar to that of the system just described.

772,213—H. Carbonelle. Electric or Telephonic Transmission.

Various schemes have been suggested from time to time for reinforcing or strengthening currents passing over a line. In railway and power work "boosters" are well known. The invention in the present case is an alternating current booster of special form. It comprises an alternating current machine having two windings with a mutual inductive relation, one being a wire laid in parallel paths across two disks with notched edges and extending all round the disks to form a cage, while the other winding is similarly laid in notches in the edges of two circular openings in stationary disks or plates surrounding the first disks which are rotary. The number of revolutions multiplied by the number of turns in the windings, of course, determines the periodicity of the current produced, one circuit or either circuit being charged as the primary of the pair. The operation is no different in principle from that underlying any of the old dynamo repeaters hitherto inserted in telephone circuits, wherein the field was connected to one circuit and the armature to the other. The supposition is that the energy employed in driving the machine is translated into current, and as this is altered in accordance with the changes in the originating circuit the repetition results in multiplication.

772,291—H. G. Pape. Automatic Circuit Closer.

This is a circuit closer to replace a switchhook. It consists of a ball or weight in the handle of a receiver, which when the latter is held up to the ear rests on a pair of springs to force them together and complete the talking circuit.

772,308—H. Abbott. Telephone Meter.

This ax is a special arrangement of the printing register idea developed in a previous patent already digested above. Here all the registers are at central and in a common casing on one frame, so that one record may be printed from all of the dials at one operation. There are ten sheets of drawing, so that no lengthy description will be attempted here, particularly as the description of the patent is largely based on mechanical detail. Generally stated, the device comprises a series of registers like time stamps, with permanent fixed dials carrying type numerals, and a rotary spindle in each carrying an indicating arrow within the dial, which is rotated one unit for each call. Above each line register dial is a permanent type set for the number of the line. These registers are arranged in rows in a common frame, and all the dials and type sets are carefully surfaced so that a common platen can be brought forward on them with an interposed sheet of paper or cardboard to print one record sheet with an impression from every register. Each dial then appears in the printed sheet with its line number over it and the number of calls its line has originated indicated by the arrow. A circuit is shown but not claimed by which no call is registered until the operator depresses a key or the desired connection is complete. By this invention the accounting department would simply take off a printed record sheet once a day or once a month, and these sheets can be cut up into cards. A register is required for every line, of course.

772,310—I. S. Ashe. Mouthpiece for Telephone Transmitters.

This comprises two mouthpieces carried on a spectacle frame pivoted to the front of a transmitter, so that either one of them can be swung in front of the opening to talk. The idea is that no one will have to use the same mouthpiece as his immediate predecessor.

772,327—R. E. Pedigo. Cut-Out for Rural Telephones.

The invention in this case consists of a knife switch and ground plate mounted on the outside of a building and with a lever extending through into the inside where it carries a rubber button. In case of storm you work the button to cut off the telephone and ground the line on the outside of the building.

GROWTH OF KANSAS CITY HOME COMPANY.

One of the most complete and best conducted Independent telephone systems in the United States is that of the Home Telephone Company of Kansas City, Missouri. Although it has been bitterly opposed by the Bell from its inception and made the target of every degree of misrepresentation it has forged steadily ahead until to-day it has nearly 12,000 telephones in use and stands head and shoulders above the Bell in public estimation. Its service is far and away the best that has ever been furnished Kansas City people and its popularity is attested to by the fact that the plant is growing at the rate of 600 subscribers per month. The best evidence, however, of the growing favor of the company is found in the peg count for the past few months, the first record of which was taken directly after the main and three branch offices were put in operation. Following is the count by months from March to October:

	"A"	"B"	Total.
March 21—	43,859	9,676	53,535
April 11—	71,458	16,274	87,722
May 10—	88,846	19,992	108,838
June 6—	106,106	24,055	130,161
August 1—	122,002	35,062	155,064
September 6—	138,164	39,798	177,962
October 3—	154,356	41,341	195,697

This shows on October 3 eighteen "A" calls per line in twenty-four hours. The above showing is a good indication of the constant growth of the company and evidences its success. O. C. Turner, general manager of the company, is an indefatigable worker and is leaving no stone unturned to increase the business of the system and so furnish subscribers with the best possible service. His efforts thus far have been highly gratifying and the future outlook is even more promising.

The stock and lines of the Western Independent Telephone Company were recently transferred to the Kansas City Home Telephone Company and the affairs of the former company are now being managed directly by the latter. The Western company was organized about a year ago by the men interested in the Home company. Its lines are now connected with more than 300 Kansas and Missouri towns, and it has a very advantageous contract with the Kinloch company of St. Louis. The Home company will at once begin the extension of its long distance lines into Nebraska and will improve its service in Kansas and Missouri. By the terms of its agreement with the Kinloch company the territory of Missouri has been divided, the northeast and southeast being apportioned to the Kinloch company and the northwest and southwest to the Home company.

Concerning Telephone Switchboards

SAMUEL G. McMEEN.

NO CENTRAL office utilizing manual apparatus, and requiring to serve more than 500 lines, may be considered to be provided with a modern equipment unless the switchboard is of the multiple type, enabling any operator to reach a jack of the called line without the assistance of a trunk to another operator in the same office. So, too, the equipment may be considered not to be of a satisfactorily modern type unless the signal to the operator is given by the mere removal of the subscriber's receiver from its hook. About the time of the advent of Independent telephony, the Bell company had developed multiple switchboards to a point where all series contacts in the jacks of the line through the board were eliminated, and the connection of the plug with the line was made by engaging springs which stood through an open in the jack until the insertion of the plug. The switchboard exhibited at the World's Fair in 1893, was of that type, and was one of the earliest ones, and in that, as in several large multiple boards installed soon after, this bridging feature of the jacks was present as well as the feature of having the line drop bridged permanently across the circuit. The insertion of the plug operated a local winding in the drop and restored the shutter, which had been released by the subscriber's call sent from his hand generator.

Such a board represented a distinct advance, and a successful getting away from the serious difficulties of series contacts in the jacks. But accidents of human ingenuity happened to produce the system of automatic signals at about that time. In the early development of switchboards using automatic signals, incandescent lamps for the line and supervisory apparatus were soon supplied. Relays actuated these. The line apparatus was patterned after the manner of the self-restoring line annunciator, and it came about that practically all of the common battery lamp signal multiple boards installed by the Bell company were provided with line relays pulled up by removing the receiver from the hook, and in turn cut off from the line by another relay operated by the insertion of the plug, and held so operated during the conversation. The upshot of this is that all of the large switchboards used by the Bell company are provided with two relays per line, and each cord circuit with one relay per plug. The jacks have each two springs and a test bushing. The investment in relays for an equipment becomes important, as they will average about 2 1-10 per line, or perhaps more. In addition to this expense of investment, the amount of current required to hold the cut-off relays operated during the conversation, foots up a considerable item of expense, particularly as the system of supervisory signals adapted for general use is one in which the lamp takes current not only while burning, but its circuit takes even more current while the lamp is extinguished.

For all these reasons, and some other minor ones, it was deemed expedient to design a common battery multiple switchboard for medium-sized exchanges in which certain sacrifices might be made to the end of accomplishing savings. The result has been a type of switchboard, designated No. 8, and which may be found in a number of exchanges of the Bell company, it being believed to be particularly suitable for installations of from 500 to 2,000 lines.

The accompanying drawings may serve to make clearer the plan followed in developing this system. Fig. 1 shows the two wires from the subscriber's telephone connected to the two springs of each of several multiple jacks in such a switchboard, the test bushings of these jacks being connected together, and, so far as that figure is concerned, to nothing else. This figure does not show all of the elements which each jack contains, and is intended to point out that the feature of carrying the limbs of the line respectively to long and short jack springs, is present in this type as in the earlier standard type. The telephone which is shown connected to the lines in Fig. 1, is that which is standard with all types of Bell common battery equipments, and will be made a study for later consideration. In passing it is interesting to know that the condenser serves two purposes, one

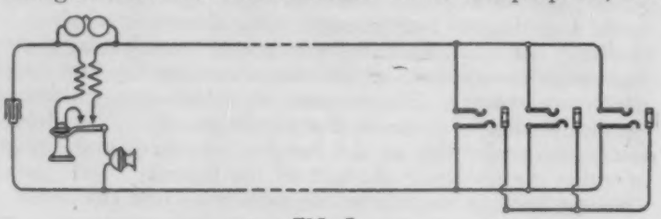


FIG. 1.

having to do with keeping the line open to direct current when the receiver is on the hook, and the other with an improvement of transmission over that possible with a mere receiver and transmitter in series with each other and the line.

An examination of Fig. 2 will show that it is a duplicate, line for line, of Fig. 1, but that certain elements have been added to the jacks and that a lamp and line relay are shown. Attention is attracted to the facts that the line relay has two windings, that a battery of thirty-six volts is in series with these windings, and that the whole combination is bridged across the line. It is a distinguishing feature of this system, therefore, that the line relay is never cut off from the line by the action of another relay, or jack contacts, or in any other way. It will be noted that the resistance of each winding of the line relay is 500 ohms, so that the bridge across the line is 1,000 ohms. Also that the armature of the relay has two contacts, one made normally, and the other

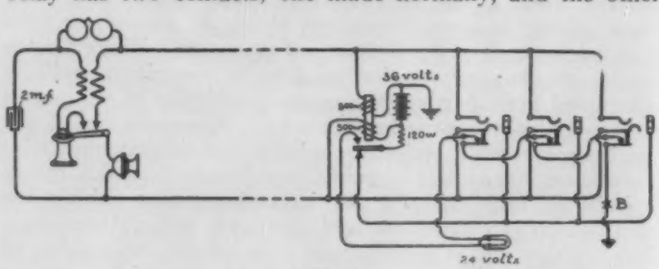


FIG. 2.

made when the receiver is off the hook. Further, that a resistance of 120 ohms connects the relay armature to the live pole of the battery.

The permanent connection of the relay to the line indicates that its armature will quite copy the motions of the subscriber's switchhook. When the front contact of the relay is closed, the line lamp will be lighted, being in series with the 36-volt battery and the 120 ohms resistance. It is also in series with a conductor carried from jack to jack through two springs which make contact when no plug is in the jack, but is broken by the insertion of the plug. This is to enable the line lamp to be put out without investing in a cut-off

relay. It is the belief of the manufacturers that a real economy is accomplished in this way. It is of course apparent at a glance that with a switchboard long enough, and of sections enough, the cost of the extra springs and their platinum contacts must become great enough to offset the saving accomplished by omitting the cut-off relay. This series conductor through all the jacks is carried to ground from the last contact spring, and an opportunity of securing pilot or night bell signals exists in the common ground wire at the end of the switchboard. The ground wire may be cut at the point *B*, and such a signal device inserted, any convenient grouping of the various ground conductors being possible for this purpose.

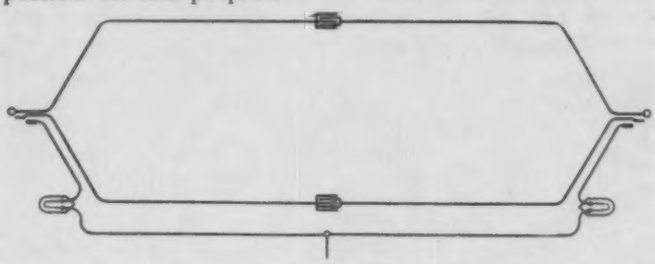


FIG. 3.

Fig. 3 is intended to show the simple scheme of the cord circuits for such a switchboard, somewhat after the manner of Fig. 1, with reference to the line circuit; in fact, the rigidly essential parts are shown without other complications. A considerable simplicity will be noted in the absence of a repeating coil, retardation coil, relays of any character, and in the fact that the supervisory signal lamps are connected merely between the plug sleeves and the ground. It is true that such a simplification does relieve the switchboard of a considerable quantity of apparatus. All that is essential for conversation between subscribers is shown in Fig. 3, although, with that arrangement alone, speech between the operator and the calling subscriber, ringing of the called subscriber, and testing for busy lines, would be impossible.

The features of answering, calling and testing are accomplished by the addition of the apparatus shown in outline in Fig. 4. The operator needs only to bridge her telephone set across the talking conductors of the cord circuit by operating the listening key *1*, or she may speak to the subscriber and learn what line he wants. The called subscriber may be rung by the use of the ringing key *2*. A test may be made in the usual manner, by touching the tip of the plug *3* to the test bushing of the called line.

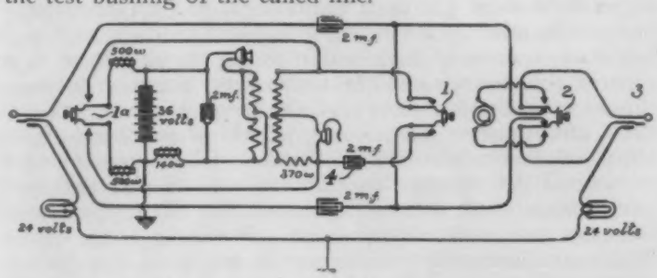


FIG. 4.

But the operator sometimes needs to connect her telephone with the cord circuit at other times than when answering a call; as, in the instance of a doubt as to the progress of the conversation, she may find it necessary to listen in on the connection. In such a case the electrical condition of the connections is disturbed, and the drawing will show that with only ordinary elements in her telephone set, the operator will cause a click at the moment of entrance to the conversation, and another on leaving it. To avoid this complication is added the key *1a*, serving to connect the two 500-ohm retardation coils in the illustrated manner with certain terminals for the operator's telephone set. The key *1a* in actual practice is merely a part of the key *1*, but I have shown it detached in the hope of making the matter clearer. The contacts of the key *1a* are so related to the parts of the key *1* that the former will make connection first, and the condition of potential at the condenser *4*, established by this means, practically eliminates the click which otherwise would follow.

Without entering into an extended description at this point, I may call attention to the elements which make up the operator's telephone set, the more notable being the peculiar arrangement of the primary circuit, the relation of the receiver to the secondary, and the resistance coil of 370 ohms. These have to do with the taking of current from the central office source, and with the elimination of side tone, which, with an arrangement of equipment similar to that of the subscriber's set, would be annoying in a central office having operators sitting very close together.

With a reasonable understanding of the line and cord circuit elements which it is hoped the drawings will give, the following brief summary of what happens will be of interest:

The subscriber removes his telephone from its hook, drawing up the armature of the line relay, and lighting his line lamp in series with the 120 ohms resistance of the relay and the series contacts of the jacks. The operator answers. The line lamp is extinguished by breaking this series contact in that jack. This is an answering jack, but the intermediate distributing board connections have been omitted in the hope of further clearness. To supply them will serve as an interesting exercise in circuit gymnastics for the benefit of the student. The subscriber receives current for his transmitter through the windings of the line relay, and through no other source. The insertion of the plug brings with it from the cord circuit no opportunity for current supply, and this is an important distinction between this No. 8 switchboard system and that of the standard equipment. Conversation ensues between the operator and subscriber. The test is made with the tip of the calling plug *3*. If the called line is not busy, no click will ensue, because both the tested bushing and the tip of the plug *3* are at the full potential of the 36-volt battery, or else the test bushings are in an open circuit, due to the fact that the called subscriber is calling and is not yet answered. Finding no test the operator will insert the plug and ring by means of the key *2*. If party lines are used, other keys may be associated with this in such a way as to give the desired result. If the called line is busy, a click will be heard, because the test bushing will not be at the full potential of the battery, and this because of the ground provided by the supervisory lamp of the distant plug in the distant jack, while the testing tip is at the full battery potential in all cases. It goes without saying, that if a plug is found to be in the actual jack reached for, no test will be made, and a busy condition will be reported.

Upon the answer of the called subscriber, he also will receive current from his individual bridged line relay. It may be considered odd that so great a resistance as 1,000 ohms may be used in the current supply for transmission. It may be believed that so great a resistance would prevent enough current reaching the subscriber to enable him to talk with any satisfaction. Curiously enough, this is not so. Transmission is quite good over lines of other than great length, and as toll connections are made with special cords containing repeating coils, ample current for a louder speech is received.

Transmitters of standard design are used, the telephone equipment at the subscriber's station being in no way un-

usual. It is indeed a question whether the quality of transmission with line relays of so high resistance is not in some small particulars more pleasing than with standard conditions, and there is without doubt a very agreeable absence of deafening clicks to annoy the subscriber and shake the windows.

In common with certain systems which have become popular in connection with Independent manufacture of switchboards, the cord circuits used with this system involve a condenser in series with each talking strand. These are two microfarad, and as actually furnished in practice, are very tightly pressed in very small tin boxes, about three inches long by one and a quarter inches square. They are mounted in the frame work of the switchboard, and in the absence of cord circuit relays, constitute practically all of the machinery associated with the keyboard equipment. Contrary to a long-rooted belief, condensers used in this way in cord circuits do not act hurtfully upon local conversations, the transmitted speech being unaffected in any injurious way. Indeed, the accepted practice of the Bell company to-day, with reference to toll switchboards, involves the use of condensers in just this relation to the cord circuits of line operators at toll boards, so that there are at least four condensers of two microfarads each in every connection between two common battery subscribers in different cities. Even when several sets of condensers of this capacity are involved in building up a connection, the character of speech does not seem to suffer, and expert listeners sometimes detect what seems to be a betterment of speech quality, while the influence of repeating coils is distinctly to degrade it.

RESOLUTIONS PLEASE JUDGE THOMAS.

At the recent convention of the National Independent Telephone Association at St. Louis there was appointed a committee to draft resolutions for greeting and good wishes to Judge James M. Thomas, ex-president of the association, whose splendid work in behalf of the cause of Independent telephony has endeared him to everyone connected in any way with the movement. Judge Thomas lies critically ill at his home, Irvington-on-the-Hudson, New York state, and the physicians hold out no hope for his recovery, and say his demise is now only a matter of weeks, possibly days. The committee appointed consisted of the following gentlemen: H. D. Critchfield, Chicago; George W. Beers, Fort Wayne; Hugh Dougherty, Buffalo, Indiana; P. Sheeron, Indianapolis, Indiana; E. B. Fisher, Grand Rapids, Michigan; C. W. Kline, Hazleton, Pennsylvania; J. B. Hoge, Cleveland, Ohio; F. L. Beam, Columbus, Ohio. The following resolutions were presented to the convention and adopted by a rising vote:

Be it resolved by the Independent Telephone Association of the United States, in convention assembled in St. Louis, this 23d day of September, 1904, that it most earnestly deplores the illness of Hon. James M. Thomas, who is at his home in Irvington, New York; that without detracting from the value of the service rendered the cause of Independent telephony by others, it recognizes in Judge Thomas one who has done more for this cause than any other living man; that from his earnest, honest and unselfish labors in the general cause of Independent telephony, from its real inception until the time of his physical disability, he has not only accomplished a great deal himself, but has stimulated and encouraged others in the work, and to his efforts most largely is due the fact that in nine years there have been placed and are now in operation in the United States approximately two and one-half million Independent telephones.

Be it further resolved, that we extend to him the sincerest sympathy of the members of the Independent Telephone Association, and through them for all others who are interested in this cause, and express the most earnest wish for his early and complete recovery.

Be it further resolved, that copies of this resolution be sent to Judge Thomas, to each of the telephone and electrical journals and be spread upon the records of this association.

The following message was forwarded to Judge Thomas in behalf of the association, by President Dougherty and Secretary Jones:

Hon. James M. Thomas, Irvington, New York.—The Independent Telephone Association of the United States, in convention assembled at St. Louis, has extended to you by resolution, this day passed, its sincerest sympathies and heartiest wishes for your early and complete recovery, copy of which is this day forwarded by letter.

A few days ago H. D. Critchfield of Chicago visited Judge Thomas, and in a letter to TELEPHONY says: "I regret exceedingly to inform you that the judge is failing materially. He was very much pleased and deeply affected by the action of the convention."

DENIES THE RUMOR OF BELL CONTROL.

The officials of the Kibbie Telephone Company of Kibbie, Michigan, have entered emphatic denial of the report that the Michigan State (Bell) Telephone Company has secured control of the Kibbie system. In reply to a letter from TELEPHONY requesting an explanation of the report, John H. Tripp, an official of the Kibbie company, wrote as follows:

On October 1 we bought out all the Twin City interests in Van Buren and Allegan counties, except the copper toll line, for which we had no use. The Michigan State Telephone Company bought that. Our company was started in a very small way. At first there were but two miles of line with a telephone at each end. The company was incorporated in 1898 with a capital of $10,000, which has been increased from time to time until it now is $100,000. At present we are doing the business of Van Buren county and the southern tier of townships of Allegan county. There is no other company here at present. This is the people's line, and is owned and controlled entirely by people of this county. We have at present eleven switchboards and about 1,600 telephones in service. S. M. Trowbridge is our president, and a good one, too. Nearly every one of our numerous subscribers is a warm friend of the company and they aid us very materially in making a success of it. We have exchanges (or switchboards) at Bangor, Hartford, Covert, Lawton, Bloomingdale, Gobleville, Lawrence, South Haven, Decatur, Paw Paw and Kibbie, with home office at Kibbie. We are constantly adding to our system. However, we do not wish to go outside of the territory now covered, but are trying to cover this thoroughly. We have a working agreement with the Michigan State Telephone Company. The Bell company has no cinch on us in any way, has nothing to say about how we shall run our business and has not a dollar invested in our company.

NEW YORK STATE IS ORGANIZING.

The executive committee of the New York State Independent Telephone Association met at Rochester, October 18, all the members except one being present. After discussing the national plan of organization as adopted at St. Louis they decided to divide the state into twelve districts, agreed the same day upon the division and appointed committees to take up the work in the various districts with a view of organizing same within the next sixty days. The district organizations will be formed very much on the same lines as the districts were organized some time ago in Ohio. The officers were instructed to become members of the National Association. H. H. Persons of Buffalo was elected trustee of the national association. The meeting was very enthusiastic, and it was developed that New York state interests are in excellent shape. President Hoge of the National association was present and reports that he was very much pleased with the meeting and with the business-like way in which the New York Independents handled their organization. He is of the opinion that New York will give the national body as good an organization as any state in the Union.

James J. Hill, the pioneer railroad king, has an aversion for telephones and never uses one when he can help it. He maintains offices in several cities, but none of them is equipped with that modern convenience so essential to the average business man.

The Traffic Manager and His Duties

HARROLD D. STROUD.

THE traffic or service man in the telephone business is a product of expansion. The small exchange has its manager who acts as wire chief, switchboard man, outside repairman, traffic man, and assumes all the duties which in a large plant are divided and subdivided as the development of the system demands. In the large system the manager has his distinct duties, which, in a very large system, are not necessarily of a technical nature. The wire chief usually has charge of the mechanical and electrical side of the office, with a switchboard repairman directly under him, and the necessary force of terminal men, trouble clerks, line, instrument and combination repairmen.

The manager often has direct supervision over the operating force and therefore in a sense, is traffic man and office manager combined. This arrangement is often found in single office systems, but in systems comprising many offices the tendency is toward separating the work of manager and traffic man. The position of traffic manager has never received full recognition, even in the largest exchanges. His duties are to see that the traffic of the entire system has free course; that it does not become congested, therefore, he should have control over not only the operating force but over the installation, underground and aerial construction departments to such an extent that he can at any time increase the capacity of the distributing cables, to take care of the increased traffic due to an increase of terminals. If he knows that the trunking cables are not ample to carry the peak of the daily traffic without a large amount of busy back calls, because there are not trunks enough between exchanges, he should have full authority to order them and see that they are increased.

Much misunderstanding exists between large telephone companies and their subscribers because the latter get the busy back, not because the called line is busy but due to shortage of trunks.

The traffic man should, in order to properly fill his place, have some control as well over the soliciting force to enable him to reduce the legitimate busy back calls due to certain busy subscribers having inadequate telephone facilities. This phase of his work is probably the most aggravating to the traffic or service manager. He is constantly receiving complaints from calling subscribers that they have tried to get a certain line and repeatedly got the busy back signal, and it is very difficult, if at all possible, to convince them that the real reason is because the called party is trying to do a three-line business over one line, and the worst part of it is that when the party finally gets his call through he is often told by some one at the called station that the line has not been busy for half an hour, with the result that the service gets another man's disrespect. This may not always be due to the called party's line being actually busy, but as stated before, may be due to shortage of trunking facilities, a fault that is never confessed to the patrons by the operators, nor should it be. The only remedy for the first, or actual busy line, is to send out solicitors to show the subscribers that they lack ample facilities with which to carry on their telephone business. This is, has been and will continue to be a difficult thing to do where telephone service is given on the flat rate plan. Because when solicited for more lines the average subscriber suspects the company of trying to get more money out of his pocket. He does not know that other people are getting the busy signal, and if he occasionally gets a complain from someone who has tried to call him he lays the blame on the service. His clerks may be using his line for social matters not at all a part of his business, yet blocking up the only telephonic entrance to his establishment with useless or needless outgoing traffic, to the exclusion of valuable business calls.

This condition is analagous to that of the man who has a place of business with only one doorway and that constantly being littered with rubbish or outgoing shipments which prevent customers from gaining an entrance, except that nowadays the telephone entrance invariably carries a much more valuable character of commerce than does the one made by the architect. If a busy man wants a thing quickly he telephones for it and then starts his office boy out to bring it in. The boy can find a way to get in even if the architectural doorway is congested, but there is no chance for the man to get his order in even though the other man's office boy is making a date with his best girl or comparing their experiences of the past evening at the candy party.

The fact that there is a busy test on the line wanted and the rules of the service rightly prevent disconnecting a line before ordered to by parties occupying it, bars him.

Theoretically, telephone subscribers are each a member of an association wherein each is responsible for the well being of the other. If they could be induced to realize this they would be materially benefited and there is possibly no better way to bring them to this realization than by intelligent solicitation by personal calls and well-worded form letters. Personal visits by subscribers to the exchanges are of much good if they are received by someone in authority, actual or apparent.

An instruction room for subscribers sounds queer but would not be out of place unless so handled as to convey the idea that the public did not understand so simple a thing as telephoning, which, while it is a fact, is also a fact that it does not pay to tell them so.

The writer has heard just such conversations as the following:

"Say, Jones, what's the matter with you, I have been calling you for half an hour and have been told that your wire was busy?"

"Is that so? I've been here all the time and no one has used the telephone and this is the first time I have heard the bell."

"I knew that girl was lying—she seems to have it in for me, but she's running it and we're footing the bills. Guess I'll get the other company to put in a telephone for me."

He does not realize that another one from the same company would cure his troubles or at least mitigate them.

The traffic man's course here would be to put in another telephone for him, only let the second one be a measured service one. Then he would have double-track service and much less chance for the busy back being used on his account. This plan, if carried out throughout the system would give better speed to the operating and shorter time on all calls, which means in language readily recognizable by the patrons, *better service.*

This, of course, does not cure the busy trunk evil, but it would be an entering wedge for measured service that would continue to spread and when generally introduced would leave plenty of trunks for the heaviest traffic the system would be called upon to serve, nothing being said of revenue.

A good plan that has been adopted by some large companies and has proved a success, is that of putting in

auxiliary telephones equipped with a five-cent coin box. The first telephone, which was usually a flat rate, was moved to a place where it could not be readily seen by outsiders and was reserved for *business only*, while the nickel telephone was placed where it was most conspicuous, and when anyone wanted to use a telephone this was the one they used.

From the foregoing it can be seen, to some extent, what the work of the traffic man embraces. He should know most of all how to deal with the subscribers, especially those who have seen the shady side of his company's service. But his work does not stop here, because if he has not the power supreme to rectify the faults which he knows to exist, whether the company or the public is at fault, he cannot properly fill his place.

One traffic manager, or such he was styled, with one of the first-class Independent companies, after a half hour's siege with a wrathy subscriber, turned to me and said: "I know what his trouble is as well and better than he does, but my company will not carry out my recommendations for increased cable facilities to his district, so what can I do? I'm a dummy. They pay me to keep things going, and when I try to do it my recommendations get the decoration of the Order of the Double Cross and I get the boomerang."

The idea of the traffic man's duties prevalent among many telephone people is that he is there to see that the operating force is properly conducted. To use Lawson's style, he is the man who handles the oil can, but unless he has oil in the can he is a poor oiler and is sure to let the bearings run dry, with the resultant drag on the service.

STREET CARS EQUIPPED WITH TELEPHONES.

"Is there a physician on the car?"

This was the anxious question asked by a passenger on one of the large interurban trolley cars of the new line of the Pittsburg Railways Company, which was running at high speed from Pittsburg to Charleroi. Although the car was crowded, there seemed to be no physician aboard, as none responded to the call.

"My wife has become ill suddenly," continued the passenger, "and she must have medical attention at once. Can anyone tell me where, in this section, I can find a doctor?"

No one knew. The car was rushing along through farm fields, occasionally passing a dwelling or group of buildings, but there was no town near which might number a physician among its inhabitants. The conductor was called from the rear platform and questioned.

"In fifteen minutes," he said, "we will be on the outskirts of Monongahela City. I'll have a physician there awaiting us."

"But how will you notify him?" was asked.

"By telephone," was the calm reply. "We have one on the car."

So he did. When the first street of Monongahela City was reached, sure enough, there was a physician waiting. While the car sped on into the city he was busily at work over his patient. Perhaps those few minutes saved a life.

A telephone on a trolley car is the latest convenience devised for the accommodation of the traveling public. It is not only for emergency use, as in the case just cited, but for any business for which a telephone may be needed. One may make an engagement, order a meal, inquire as to stock quotations or converse upon any subject while bounding over the rails from town to town on this extensive network of suburban lines. As the start in this direction has been successful, trolley passengers in many other cities may soon be provided with telephone service as they journey over the rails.

On each of the cars of the Pittsburg Railways Company is a complete long-distance telephone, and at least one telephone wire runs along each line of the system. Connections may be made from the cars direct to any of the 150 telephones located in the big office building, on Sixth avenue, Pittsburg, with the numberless telephones located within a radius of 200 miles around that city, or over any of the sixteen trunk lines to one of the district offices of the Bell Telephone Company of Pittsburg.

The conductor on the Monongahela City car simply called up the company's headquarters in Pittsburg and told of the trouble. The headquarters people called up the physician and told him where to meet his patient. The location was then telephoned the conductor, who, in turn, notified the motorman, and a record-breaking run was made to the designated meeting point. If used for no other purpose than to summon aid in case of accident, this trolley car telephone service on suburban lines will undoubtedly prove a blessing, but, as stated, it is open for any form of communication a traveler may desire.

James W. Boden, superintendent of telephones for the Philadelphia company which controls the Pittsburg Railways Company, has given his time and attention to the installation of the instruments, and feels proud of his work. He was assisted by S. P. Grace, engineer, and J. B. Reddig, assistant engineer, of the Central District and Printing Telephone Company.

A WELL KNOWN TELEPHONE MAN.

A. J. Rousseau is one of the men in the Independent telephone field who has seen the many sides of the industry.

He was born in Chicago thirty-five years ago and received his first telephone experience from the Chicago Telephone Company in the days when the telephone was being exploited as a commercial necessity. He made telephone work a study in the various departments of the Chicago company, as well as when with the Rocky Mountain Telephone Company in Colorado and the Southwestern Telephone and Telegraph Company throughout the Southwest. He remained with the above companies until 1889, when he entered the electric lighting field. In 1895 Mr. Rousseau returned to the telephone field, first with the old Harrison company and afterward with the Victor Telephone Manufacturing Company, Kellogg Switchboard and Supply Company, and Stromberg-Carlson Telephone Manufacturing Company, being now connected with the Automatic Electric Company of Chicago.

Mr. Rousseau has been particularly successful in securing orders for large installations, and in promoting companies and securing franchises. He is well known among manufacturers and exchange men and is deservedly popular. He is a young man from whom much is expected, and unquestionably will make still more of a name for himself in the telephone field.

The telephone took the place of the service of orderlies at the recent camp of instruction of the Indiana National Guard at Fort Benjamin Harrison, near Indianapolis. The system was put in by the signal corps to connect the brigadier-general with the colonels, quartermaster-general and the commissary.

QUESTIONS AND ANSWERS

Conducted by J. C. Kelsey, Purdue University, Lafayette, Indiana.

When a telephone company is located and doing business in a place, and giving satisfactory service, and has some grounded lines, but all giving good service, can an electric light company come into the same town, build its plant and turn on the current, thereby making all the grounded lines of the telephone company useless, without making due recompense to the telephone company? That is practically the situation here. We have about seventy-five common return lines, and these are rendered useless as soon as the street lighting current is turned on. Now what we want to know is this—has there ever been a similar case, and has it been taken to the courts, and if so, what was the result? Could we compel the electric light company to make all our lines metallic, or, in other words, can we compel them to place our lines in as good condition as they were before the advent of the lighting company? If there has been no decision, what is your opinion?—M. E. C., Indiana.

Prior to the advent of the street railway trolley practice, the Bell Telephone Company operated grounded systems exclusively. When the trolley systems were put into operation, the telephone companies were put out of business in a sense. Naturally they flew to the courts and asked that their comfortable occupation of the earth be not disturbed by a new occupant. It would not be hard to guess the decision of the court. Would it not have been preposterous to have enjoined the trolley companies from the use of an earth return, simply because a small telephone company was there first. Both are public utilities, demanded by the public, and the people themselves would not stand for a decision hindering the development of street car service. The reason that the telephone company lost was because there was such a simple remedy that could be employed. Simply a common return. And it was to the interest of the city companies to have metallic service anyway, because they were going into the long distance business, and one knows that grounded service has to be subject to inefficient transformation before it can be connected with long distance lines.

As to an award of damages, I don't know. Had there been, it would even involve a much greater expense to the company than if they had gone to work and put their lines on a common return basis. Lawyers and experts come high, costing from $25 to $50 a day, while good linemen can be secured for $2.50 or $2.75 a day. I am not taking sides against the telephone interests, but simply want to impress upon the prospective plaintiff that his 100-line system is too small an affair to drag into courts. It would be much cheaper to get together and be of mutual aid, or even go it alone.

If the lighting plant puts the grounded lines out of commission, the next recourse would be to common return. But before doing this, suppose the electric light company will agree to double back its series wires, direct or alternating current, whenever they parallel the telephone lead. In this way, the wires of the lighting company will be made to neutralize their external inductive effects, and leave your lines free from trouble. Supposing that the lines have been doubled back on themselves, and a great noise is still present. The lighting company is supposed to have a metallic system, entirely free from grounds. But owing to high potentials employed, there is bound to be a leak, or ground in some one place, which will not materially bother the electric company, but it will bother the telephone company. The ordinary lighting potential in a small town would range from 1,000 to 3,000 volts. If the light wires paralleled the telephone lead where the position of lamps gave a potential with respect to earth of 2,000 volts, then the telephone lead would be subjected to an inductive stress of 2,000 volts. This would be an electrostatic stress, but 2,000 volts is hard to insulate against, even for metallic service, but with grounded lines the charges induced from this electrostatic strain would have a free path to earth, and make noise in the receivers. If that ground could be removed, together with all traces of leakage, and coupled with doubling back on itself when paralleling leads there would be no noise on the grounded lines. Unfortunately such grounds or leaks exist on lighting mains, and the telephone lines are always subjected to stresses and charges. The next recourse would be the common return system, which would have to be well insulated to prevent the charges on the lines from seeking the earth. With 2,000-volt electrostatic strain the insulation would have to be pretty good or a breakdown would occur somewhere through trees or poles and the system made noisy. So to prevent the noise, it would be necessary to have the ground removed from the return altogether, and the few grounded lines put on the return.

If the electric light company would watch its series system, double back on single wires, and keep a sharp lookout for leaks and grounds, the common return system would be successful. There are thousands of cities with common return lines, which have to deal with trolley, electric light, and all kinds of power currents. The only grounded system we have is the trolley, which will not give much trouble with ordinary precautions, owing to the low potential. But where the electric light company is careless, there is bound to be trouble for the telephone company in spite of the greatest precautions. The telephone company could certainly compel the electric light company to put its own system in good repair. Nature will allow any system to operate with another if all conditions are right. I think the law in this case of W. E. C. could be invoked to aid the telephone company, and compel the lighting company to adopt certain precautions. I would urge, however, a get-together plan. Work in harmony—and save money. Litigation is conducted by the highest priced men in the world, and ordinary construction is done by a class of men whose charges are very small in comparison. My suggestion is to try all the means at hand before fighting. You may be sure that a common return system in good shape ought to serve you well, if you and the electric light company observe all reasonable precautions. Before making a system metallic, it is well to try out the common return to its fullest extent, as long as there is very little expense. The stakes are not high enough to take chances.

We are an old established telephone company, and are operating a grounded telephone line system between X and Y, about ten miles apart. A private line, grounded, has been run parallel with our wire, on the inside of the fence, for about six miles. The cross talk between these two lines is very bad. Have we not some rights, being the older company by six years? What is the law about this matter?—J. L. M., Kansas.

Here is another case. I do not know what the law is, but feel that such a case is too small for the law. You are operating between two towns in a country where there is a fair toll business, and occasionally a call over this line in question

goes to Kansas City over a pair of No. 8 copper wires. You get some revenue out of that call, and you spoil a long-distance connection, which should be good, by a transformation which puts that little ten miles of cross-talky line in connection with a magnificent No. 8 copper line. For the good of the cause Independent telephony that private line owner should be thanked for compelling you to put in another wire, and make that ten miles metallic. It would cost little, and the results would be great. If you sued the private line owner, enjoined him forever, it would be money illy spent. Better invest it in another wire.

We are contemplating running an electric light line, single phase, alternating current at 4,400 volts, for twelve miles upon the same pole line as the telephone line. Which is the better construction, to run the line upon the same cross arms as the telephone wires, or upon separate cross arms? We have been advised that if run upon the same arms and properly transposed, the inductive effects will be less than if we run separate arms. The pins are spaced twelve inches apart.—A. G., Washington.

Here is a case where no litigation will result. If the lighting wires are properly transposed, there will be no difference between the effects whether one arm is used, or another. It would be cheaper to use the same arm, anyway. As long as the 4,400-volt line is neutralized, and leakage prevented, there will be no trouble to the telephone lines. If one of the 4,400-volt wires becomes grounded it might not cause the power circuit any inconvenience, but it will certainly inconvenience the telephone line. If one side is grounded, then the other side of the line has 4,400 volts above the earth. This 4,400 volts will induce charges on the telephone line of 4,400 volts potential with respect to earth, and it would not surprise me to see the telephone lines breaking down and grounding under the heavy stress. There might be an advantage if a separate arm is used. It would be a gain in distance, as effects of induction decrease as the square of the distance. But there will be induction effects as long as the power line is properly transposed and insulated. Remember, poor insulation will make the telephone lines give uncertain service. It would be interesting to know the experience resulting from this combination.

Supposing the three circuit telephone line, 120 miles in length, transposed as in the enclosed diagram—Fig. 1. (Note the change in the way the transpositions in the two outside circuits are staggered about the middle of the distance.) Would the change of transposing have any bad effect on any of the circuits, theoretically or practically?—R. P. J., Illinois.

Circuits 1 and 3 on the outside would still be balanced, and consequently would permit of no intereffect. Both 1

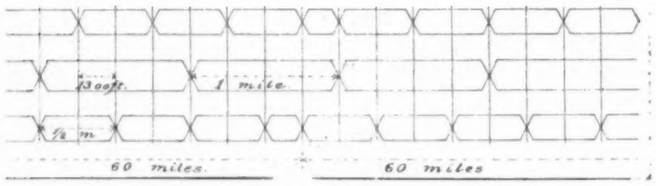


FIG. 1.

and 3 bear the same relation to 2, or the middle pair, and if any unbalance came out of it, they would be affected equally. It is only in the short space of a half mile that the usual line conditions are broken up, and then in even points, at quarter mile intervals. Either practically, or theoretically, it seems to me that the balance of the three lines as a whole is not disturbed in the least.

Will you please explain to me about a condenser, the various kinds, etc.? Are there different kinds made? Why are some bridged, and why are some put in series? Is there a noise condenser?—H. P., B. T. Co.

A condenser in telephone practice is of but one kind, the kind made by rolling two strips of tin-foil with a sheet of paper between. It is then soaked in paraffine, until bubbles cease to rise, and is then pressed and cooled, and finally sealed in a tin case. The measure of a condenser is in microfarads, which is determined by the size of the tin-foil roll. In the ordinary common battery telephone, the condenser is placed in series with a thousand-ohm bell to allow passage of ringing currents, and bar out direct currents, which would cause permanent signals at central, if otherwise. The only way in which the distinction of series and bridging is brought out is this way—if you had ten two-microfarad condensers and wanted to get a total of twenty out of them, you would put them in bridge, or in parallel, which would be the same as putting in one condenser of twenty times the area of tin-foil. To get one microfarad capacity out of two microfarad condensers, you would have to put two two-microfarad condensers in series. Putting condensers in series is like putting resistances in parallel. The same formula holds. In circuits where ringing has to be done, as in the common battery instrument, a two-microfarad condenser is used. If there is nothing to do but to talk through the condenser it can be one, or less microfarads. A condenser could not be bridged directly across a talking circuit, because to high frequency voice currents, it would be like a short-circuit. In the retardation common battery systems, condensers are placed directly in the talking circuit, in series, one might say, and they carry voice currents just as well as copper wires. About a noise condenser, I cannot say. Placed in grounded line circuits, they may be used to stop the flow of earth currents, which produce noises. But most noise-producing currents are alternating in character, hence a condenser is useless for that work. Practically, the condenser is used only to prevent direct current from flowing in circuits, and to allow alternating currents. Without the condenser the ordinary common battery instrument would be in a bad way.

We have a shunt wound motor, about two horsepower, operating on 110-volt mains. The other day I measured the resistance of the armature between brushes, and found that it was virtually nothing. I finally concluded the resistance of the armature to be .01 of an ohm. What I do not understand is why, when this low resistance is placed across the 110-volt circuit, 10,000 amperes would not flow, from Ohm's law of pressure divided by resistance. I can see that such an immense current does not flow, because the 30 ampere fuses would blow out. And also, whatever the load, that motor will run practically at the same speed. What is the regulating feature?—E. D. M., Maine.

According to Ohm's law, 110 volts would force 10,000 amperes through a resistance of .01 ohms. But reason tells us that is more current than the whole electric plant could furnish, and much more than we could care to pay for. You have noticed that the only time this low resistance of the armature is across the 110-volt circuit is when the motor is running. That is the saving grace. You have noticed that when the current is shut off for a time and is put on the lines again that your fuses are blown, if the motor is left on the circuit standing still, with all the resistance of the rheostat left out. This proves that running has something to do with the conditions. When the motor is started, all the resistance of the rheostat is in the armature circuit, possibly ranging to 100 ohms. As you get the motor under way, you push the rheostat handle around to the end, and leave it where all the resistance is cut out. Then you have the running motor bridging .01 ohms across the line.

The pressure generated by a dynamo depends upon the number of turns on the armature, the number of lines of force excited in the field magnets, and the speed in which it runs. The pressure generated by the running motor depends upon the same thing. So when the motor gets up to full speed, the product of its speed, number of armature conductors, and lines of force in the field magnets, is 110, because it is designed for 110 volts. This 110 volts acts directly against the voltage of the dynamo, and does not permit

any energy to reach the motor. This could not be true, for the motor must get energy from the dynamo. Therefore, the motor up to speed, on open circuit, would generate an electromotive force of say, 109.98 volts. If this pressure were opposing the 110 volts of the dynamo, then a difference of .02 volts would exist, which would act on the motor armature. Dividing .02 volts by .01 ohms gives two amperes. Two amperes multiplied by 110 volts, gives 220 watts, or nearly three-tenths of a horsepower. Supposing that you throw on some more load, and the voltmeter on the motor shows 109.9, which is called the counter electromotive force, then .1 of a volt acts on the motor; .1 divided by .01, the resistance of the armature, gives 10 amperes acting on the motor armature. Ten times 110 volts gives 1,100 watts, or 1½ horsepower. If your motor has an output of two horsepower, then full load would pull the electromotive force down, by reason of slackening speed, to such a point that 14 amperes would flow through the armature and act on that low resistance. To allow 14 amperes to flow through armature, the motor voltage would have to drop to 109.86. If your whole 110 volts acted on the low resistance, then something would happen. That is just what happens when the 110 volts act on a motor standing still, with all the resistance out of the armature circuit. If your armature had a high resistance, something like 100 ohms, it is plain that no work would come out of it.

The same peculiar phenomenon holds in the case of the transformer, which allows a fairly low resistance primary winding to be placed across the high voltage circuit, and no current will flow, simply because the primary winding of transformer has an electromotive force, or counter electromotive force, equal to the dynamo, and refuses to let any current act on the winding. Suppose you turn on one incandescent lamp. Current flows in the secondary winding, enough to light the lamp, which opposes the primary circuit. As a result, the counter electromotive force of the primary is weakened enough to let enough current flow to furnish the energy for one lamp. Suppose you turn on 30 lamps, then 15 amperes will flow in the secondary, and accordingly weakens the primary to the extent of allowing energy for 30 lamps. Suppose you short-circuit the secondary. You weaken the resisting power of the primary entirely. An abnormal amount of current rushes in, and the primary fuse blows. If you and I push against each other, exerting our fullest energy, without either one moving, no work would be done. If you pushed me back, then the force pushing me, multiplied by the distance covered would be the work done. Your dynamo and motor push against each other equally nearly. To get work done, the motor must be weakened, so that the dynamo will push the motor back. Pardon the analogy.

INTER-STATE INDEPENDENT CONVENTION.

Secretary Coleman of the Inter-State Telephone Association has issued the call for the annual convention to be held in Chicago, December 13, 14 and 15. The special committees appointed at the last meeting of the association have worked diligently throughout the year, and will make reports, which, it is asserted, will show that a great deal of work has been accomplished for the Independent movement. In the plan outlined and adopted by the committee are contemplated the opening of permanent headquarters, to be the office and center of the association, and to establish in the headquarters three distinct bureaus, viz., "Information and Statistics," "Promotion and Protection," "Uniformity and Standardization." Preliminary announcements and circulars outlining the plans to be discussed at the December meeting are being sent to Independent operators, manufacturers and supply houses from the office of Secretary Coleman at Louisville, Kentucky.

THE WIRELESS TELEPHONE.

BY PROFESSOR MAJORAM.

I am asked to explain in "popular" language my wireless telephone, by which messages have been sent between points seventeen miles apart. To give an idea of the basis of my investigation, let me refer to the wireless telegraph. It is known that with the Marconi system when a spark is discharged at the transmitting station there are heard in the detector sounds corresponding to each spark discharged. The detector, as is known, was invented by Marconi for this purpose, the telegrapher listening to the sound of the sparks being able to decipher the telegram. Ordinarily the number of sparks that are discharged by the Marconi apparatus is not more than ten per second at a maximum.

This limit is sufficient for the purposes of telegraphic transmission, but it was necessary for my purpose to obtain a great increase over this. With this in view I commenced by enormously increasing this number, and I soon succeeded in discharging as many as 10,000 a second, each discharge being much weaker than that adopted in telegraphy. This being the case, whoever is present at the detector hears nothing, since the sparks succeed each other with extreme rapidity and are all of equal intensity.

If, however, by means of some arrangement the intensity of the sparks is changed, and if these variations are caused by and correspond to the vibrations of the living voice of a person who is speaking, the words will be faithfully reproduced at the detector. The question thus is to modulate the series of sparks, making them now shorter, now longer, under the action of the words. I have conceived many devices for the purpose, and at present am working on a special microphone which I hope soon to introduce to the public.

If the invention should prove of practical use, there is no reason why it should not supersede the wireless telegraph, in many instances, especially when the distance is not over seventy-five miles. It is not permitted at present to speak of greater distances, but one would have the advantage of obtaining rapidity of transmission ten times greater than with the wireless telegraph, the human words developing much more rapidly than the telegraphic sign.

TELEPHONE AND AUTOMOBILE.

Those modern conveniences—the rural telephone and the automobile—were the cause of saving the life of the 10-year-old daughter of Scott Schlict, a prominent and wealthy farmer, living near Oliver, South Dakota. While engaged in raking hay the horses driven by the girl became frightened and ran away, throwing her in front of the rake teeth, in which she became fastened. The unfortunate girl was dragged some distance, and the flesh on her body and face was frightfully mangled. The family physician, Dr. Stonebraker, was at a point eighteen miles distant when informed by rural telephone of the accident. He immediately jumped into his automobile, and after a record-breaking trip reached the bedside of the injured girl. Had it not been for the time saved by means of the telephone and automobile the girl would have bled to death before his arrival.

MUSIC FOR THE MOUNTAINEERS.

Recently several experiments have been made at the Mormon tabernacle in Salt Lake City, during the organ and choir rehearsals, to determine how far the music could be transmitted over the telephone. It is said that the experiments are proving a success. It is planned to connect up all the cities in the mountain region with the tabernacle while the music is being given, and people in every large city can hear it by use of the telephone.

Telephony.

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ORGANIZATION.

IN EVERY walk of life to-day—and more particularly as applied to modern business methods—the spirit of organization permeates every line of industry and is the ruling power in the commercial world. More than in any other country on the globe this is true in the United States, where the passion for organization has become a very part of the nation's life, and where it has almost invariably been found that the combining of interests and the systematizing of operations has made for success in its broadest sense. At the recent convention of the national Independent telephone interests at St. Louis the slogan of the hosts there assembled was "Better organization," and this had its bearing on every phase of the Independent movement with the end in view that its progress might be even more marked in the future than in the past, and that with thorough organization—district, state and national—the Independents might come fully into their own. That the recent remarkable advance which has been made in the Independent field is largely due to the carrying out of well-defined plans of organization was unanimously conceded, and it was this knowledge that lent inspiration to the gathering and caused the delegates to bend their mightiest efforts toward still further spreading the propaganda.

In his paper on "The Value of Organization," James B. Hoge, the newly elected president of the National Independent Telephone Association, struck the keynote of the organization idea when he said:

"Organization is the watchword of the twentieth century. There never was a time in the world's history when the subject of organization received so much attention as at present. It is generally conceded that proper organization is a good thing, but that in some cases its privileges are abused. However, that does not condemn organizations any more than the fact that the daily violations of laws condemns the necessity of having national, state and municipal laws for the government of our people."

In enunciating the above sentiments President Hoge "speaks by the card," as it were, for he hails from Ohio, where the germ of organization has entered the Independent field and spread and spread until now the entire state, insofar as relates to the Independent telephone movement, is aflame with the organization spirit and is already reaping the benefits of the forward step in the cause, which is the logical outgrowth of the great Independent development in the Buckeye state. In other states also there is just as urgent demand for organization and for grasping present opportunities in the way of openings for growth and increased emoluments; and it is a favorable and promising sign to note the activity and oneness of purpose that is being exhibited by Independent workers on all hands—a direct result of the first steps in better organization.

Although there was published in these columns last month an outline of the Ohio plan of organization, we believe that the subject is of such importance that it will bear still further presentation. In referring again to the "Ohio idea" we employ the words used by President Hoge in describing it:

"During the past eight months we have reorganized the Ohio Independent Telephone Association by dividing the state into nine districts. The association has a president and nine vice-presidents, secretary, assistant secretary and treasurer and an executive committee of four members besides the president, he being an ex-officio member. There is one vice-president from each district and this vice-president is president of his district. Each district has an executive committee, consisting of one representative from each county in the district. Hereafter our state association meeting will be a delegate body. Each district will elect one

delegate to the state convention for each 1,000 telephones or fraction thereof they have represented by their district associations. A mile of long-distance toll line is counted as one telephone. In this way district meetings will be held quarterly and semi-annually so as to bring people with common interests together frequently to discuss subjects of special importance to the district. In this way operating methods, rules and regulations, etc., can be standardized, and meetings can be held with the loss of but very little time and at a nominal expense.

"The state association will take up subjects of special importance to the Independent telephone interests of the entire state. We believe this plan is feasible and practicable for all the states in the Union to adopt. We believe it feasible and practicable to carry it a step further, making an organization of the various state organizations so that the various districts would elect one delegate annually to a general convention, and the state associations at their annual meetings would elect a sufficient number so as to give the state one representative for each 10,000 telephones or 10,000 miles of toll line they have represented in their state associations. In that way the state delegations would be able to exchange ideas and to conduct their business on a uniform basis. Statistics can be accumulated and published that will be of special value to the Independent companies by working the entire plan out on a basis of this kind, and the securities of the various companies will be strengthened. The equipment of the companies will be improved upon from time to time. The disposition of two companies to parallel lines or to compete with each other in any way will be a minimum. The matter of adverse legislation, national or state, can be protected. This sort of an organization would be able to get the best results from their various business and political leaders.

"This is not a new method of organization; it is applying a well established and well developed plan to our business. It is human nature to take pride in being part of a successful organization."

Here in a nutshell we have the whole plan of Independent organization, included in which also is the matter of standardization of operating methods, etc., and a solution of this problem, which at the present time is one of the most vitally important that Independent telephone men have to deal with. Only by intelligent organization will the integrity of the Independent movement be preserved. Not alone is there a need of combining of interests, but an increasing demand for eternal vigilance and aggressive action after a satisfactory organization has been effected, as only in this manner can the Independents overcome the merciless competition which they must encounter at every turn.

Poor organization is worse than none at all, and here again we quote from President Hoge's paper: "In conclusion I desire to urge the importance of proper organization. We must draw a line to perfect the Independent system, and then cut to that line; then the results will be most advantageous to all. First, it will improve and simplify the service which benefits the patrons. Second, it will reduce the operating and construction expenses to a minimum, give greater stability to the securities and be generally beneficial to all companies. There is room for two telephone systems, but not room for a third. With the proper organization on the part of the Independent companies, they will continue to be the stronger and will receive their full share of the business upon a fair and profitable basis."

Now that a strong and splendidly officered national organization has been launched it is confidently expected that in those states where no Independent organization exists, or where interest in the movement as a whole has been allowed to lag, the workers will bestir themselves and, with the object in view of contributing their best efforts to the success of the organization movement, labor as never before for its furtherance. If each man does his share in the work that is all that will be necessary to make the organization of the Independent telephone interests of the United States the most powerful agent of its kind and the grandest thing for the people that this country has ever known. Are you doing your part?

AN OUTLANDER'S VIEW

JOHN HESKETH lives a long way off. He found reason for a great amount of telephone cable trouble, and came around the world to tell his plain story of facts. But there would have been no story unless he, or some other good man, had thought hard enough and worked hard enough to reach a definite conclusion, simple as it is when we know about it. While he was here to tell the story, John Hesketh saw a great many things, and he has said that we Americans are a remarkable people; that our industrial progress is great; that our telephone exchanges and lines are well designed, constructed and operated, and that in very many particulars our success is greater than he has found in other parts of the world.

Perhaps we are inclined to admit all this, assuming that only the ignorant could deny it. But Mr. Hesketh has viewed the telephone situation with much close observation, and drawn conclusions with such keen insight, that his opinions in a certain way are of much more value than our own. He sees in our situation a long future in which telephone service will be given by two great interests in competition with each other; he sees a growing popularity, an increasing effectiveness and an enlarged usefulness of Independent telephony; an elimination of probable errors due to immature judgment; and a final reaching of stability in Independent securities and the public's appreciation of them.

Coming as a visitor, with no great prejudice in our favor, and with a fair mind, Mr. Hesketh has included both Bell and Independent operations in the scope of his study, and the conclusions which he draws ought to be highly gratifying to all who have the real good of Independent telephony at heart.

UNIVERSAL TELEPHONY.

IN A recent magazine article, Frederick W. Coburn of Winchester, Massachusetts, says: "Universal telephony—an era of talk unrestricted by considerations of time and space—that's what we are facing toward. Every telephone engineer looks confidently forward to a day on which the President of the United States will, as a matter of course, call up the Czar of all the Russias to discuss some matter or other that is before the Hague tribunal; when the merchant in New York will by means of the telephone keep in constant communication with his agents in Bogota and Buenos Ayres."

Think of it! Less than thirty years ago were completed the experiments which resulted in the invention of the telephone receiver. The first speaking telephone which was exhibited at the Centennial Exhibition at Philadelphia in 1876 was to all intents and purposes a scientific toy. Twenty-five years ago the transmission of a telephone message between the cities of Boston and Lowell, only twenty-five miles apart, in Massachusetts, marked the beginning of long-distance telephony. At that time there were invested in telephone plants in this country not more than a million dollars. This year, the quarter centennial of the time when city first talked with city, the Independent and Bell telephone systems have grown until they cover all parts of the United States, with portions of Canada and Mexico,

and the investment represented exceeds $300,000,000. In the United States alone there are over 5,000,000 telephones in use, the ratio being two Independent to one Bell. Upward of 50,000,000 people on the North American continent have now been brought into communication with each other by means of the telephone.

And this is only a beginning, as a few initiates understand, though the average man does not realize the potentialities of the instrument at his desk. Nothing stands between us and universal communicability but the present incomplete evolution of telephonic apparatus. Yet a few years and locomotion will be a matter of choice rather than of necessity. People will travel for pleasure often, rarely for business. The New Yorker even now does not need to run over to Boston or Philadelphia to conclude a deal; he simply prepares his talk and delivers it over the telephone. Another decade will find New York and San Francisco similarly connected.

The greatness of telephony does not consist in such facts as that the wires already stretched would reach from the earth to the moon—if, indeed, they would; but in the truth that space and time are being virtually annihilated for the benefit of man, the creature that thinks. For it is not merely the transference of speech that has been accelerated; it is the transference of thought. When the philosopher of the next century has a message to give out odds are that it will be given over the telephone.

The speech transference of the future will all be done over the wires of a single, unified system, so the wise ones tell us. An era of competition—such as is the present—must necessarily be an era of transition. Only scientists of daring imagination may venture to make predictions as to the ultimate scientific achievements in the telephone field. Already telephoning is done experimentally over a ray of light without the use of the intermediary wire, and, though the practical use of the light medium seems at present to be somewhat limited, one needs to remember that the practical usefulness of the electrically charged wire scarcely appeared at first.

Telephony of the future will keep all the dwellers in isolated places in close touch with the great centers of activity—the lighthouse keeper, the meteorological observers on lonely mountain tops, the lumberman in the woods and the settlers on the nethermost prairies. Loneliness will have been annihilated. People will go to see each other only for the delight of looking into each other's eyes; personal contact will then be a luxury, no longer a necessity. Practically all the business of the world will be conducted over the wires. The telephone in that era will prove to have had its part in making one city of the entire stretch of Atlantic coast from Portland through Richmond. It will likewise have helped to unite a vast western metropolis on Puget Sound. It will have been the greatest force making for the unification of the American people. Already the man who dines sits often with the telephonic instrument before him. In the future he will go to sleep with the receiver over his ear, trusting to be apprised of anything of moment to him that is happening on earth or in the other world.

ONE STEP MORE.

FOR a very long time after the beginning of the telephone industry, all the measurements applied to telephone circuits, so far as electrical dimensions and values are concerned, were those which had been found useful and advantageous in telegraphy. After a time it was found that more needed to be known about the capacity of circuits, because the more capacity the worse they talked, and so men began to investigate that phase. Still later the inductance of conductors began to be considered, not because too much of it was hurtful if in the line wires, but because more of it might be inserted to advantage. So such knowledge as might be had was applied to this phase.

But no one has been able to put into a telephone line at one end a kind of current, which, measured as received at the other end, will tell exactly how good the circuit might be considered for use, and thus by repeating the tests determine the continuous, good condition of the line, or a falling from grace through defect.

Dr. Kennelly has shown the way, and this through a most admirable adaptation of apparatus not originally designed for telephonic use at all. A little loop of excessively fine platinum wire contributed by Dr. Fessenden to space telegraphy, is adopted by telephony with distinct advantage.

These are the things that make for progress. Let us hope that someone will give us facts and apparatus so that we may do more than merely say that only five parts arrive in Chicago of a thousand parts of speech put into the line at New York. This is probably true, but carries with it a feeling that someone has been guessing, in the absence of our being told how they arrive at the solution.

SEEING BY TELEPHONE.

THE Portland, Oregon, machinist, J. B. Fowler, who, after twenty-six years of brain-toil, evolved a telephone attachment enabling the persons using the instrument to see each other as they talk, doesn't propose to be beaten out of the invention by having some clever individual, in the guise of a friend, view the working of the contrivance and then appropriate the idea and exploit it as his own. Mr. Fowler, it seems, has had some experience in this line. Several years ago he perfected an invention which operated successfully, and in his enthusiasm he exhibited it in detail to a supposed friend before he had applied for letters patent on it. The "friend," Mr. Fowler says, stole a march on him, hurriedly executed a model that was almost an exact counterpart of his, secured a patent on it and sold it outright for $60,000.

With that experience in mind Mr. Fowler has maintained the utmost secrecy regarding the construction of his "seeing telephone," and recently when the excitement at Portland became so intense and visitors to Mr. Fowler's home so numerous and so persistent in their demands to see the instrument work, the inventor, fearing someone would discover his secret and rob him of the fruits of his years of labor, smashed the box into a thousand pieces and burned the fragments. He will, however, construct another one at his leisure, it is said, and secure a patent on it.

In the October TELEPHONY was published a brief account of Fowler's "seeing telephone." The facts concerning the invention were taken from a newspaper "special" sent out from Portland and given wide circulation, which stated that "the attachment has been demonstrated and has proven to be a success for short distances. In making the tests the faces of the operators were visible, even the teeth being plainly seen to the person at the other end of the line. The plan of the invention came to Fowler in a dream had in 1897, when he thought that he invited his friends to see a performance given at a theater several miles away. Since that time he has been working on the invention. How far it will be possible to see faces over the wire must yet be ascertained, for Fowler has kept the entire line within his own residence.

To the observer there appears an apparatus much resembling the front end of a large camera. There is also a telephonic transmitter. To see over the wire one puts his eyes to the tube which corresponds to the lens of a camera. The inventor's daughter went to the other end of the wire, twenty-five feet away, in another room, and where any reflecting by mirrors was out of the question. Her face

showed up as distinctly and clear as a miniature painting. As she spoke her lips were seen to move.

The observer was in darkness that he might see the more clearly. Fowler has not yet doubled his apparatus so that both persons may observe one another as they speak. He believes that this can easily be done. Apparently electrical incandescence plays a large part.

The inventor of the "seeing telephone" refused to indicate by the slightest allusion anything of the plan he adopted, the experiments he has followed up or the theories he has pursued in gaining his marvelous results. That is the one thing that no one shall know, he says, until he has worked out and perfected his invention to suit his desires and has protected the child of his brain by the guarantee of the United States.

Surmise is rife in the electrical world as to how Mr. Fowler has been able to accomplish the long-dreamed-of feat of transmitting and reproducing the form and likeness of objects both animate and inanimate over an electrified wire, but to all it is a mystery to which the inventor himself holds the key. When Bell first exhibited his model of the telephone in 1876, the performance of the instrument was as wonderful to the public, as the fact of being able to see over a wire is to-day. To be able to hear and recognize the voice of a friend coming from the end of a cold and unresponsive wire was then as great an anomaly as it is now to see the likeness of a human face form and grow upon the lense of an electrified box. Yet one may be as simple as the other.

As everyone knows, or should know, the action of a telephone in reproducing the sounds of the human voice is due to the impact of the sound waves upon the delicate disk of the mouthpiece of the instrument, the transmission of these infinitesimal vibrations by the electric current along the route of the transmitting wire to the second disk of the receiver from which the identical sounds introduced are given out. Or, stated differently, certain sounds are produced by certain definite and unchangeable wave disturbances either in the atmospheric ether, as is claimed by some, or in some other indefinable transmitting medium. These waves, beating against the surface of the transmitting disk of the telephone, produce exactly similar disturbances of the second disk, which in turn sets up the same disturbance of the atmospheric medium and reproduces the sound transmitted.

Similar lines of argument are followed by those who would attempt to solve the riddle of Mr. Fowler's invention. Color is produced by an infinite succession and variety of light waves. The representation of the human face, or of any object, is but a combination of different colors, and, therefore, of many and different waves of light. Therefore, if it is possible to transmit the tones of the voice along the wire because it is possible to find a disk delicate enough to record the disturbances in the medium, why is it not possible to discover a disk susceptible to the light waves that go to form and make up the lines of the human face or of some inanimate object?

The method is simple in theory, so say the wise ones, but the application of the principle is where the task becomes difficult. Mr. Fowler has solved the riddle, but whether by disk or lens, or by what not, he will not say. Time will settle the question, and will tell the answer. There is one thing, however, that the inventor will say, and that is, that his invention is not connected with, or in any manner dependent upon the telephone. It is a separate and distinct instrument, but seems to be a natural complement to the older instrument. It is natural in conversation to see the person to whom you are addressing your remarks, and why should not it be the same when talking over the telephone?

Mr. Fowler will follow up his simple telephone attachment, by which the operator will be able to see the person with whom he is talking, and will complete it and bring it into use, he says, for this he considers to be the thing of greatest moment at this time. After that phase of his invention has been perfected, he will take up all of the other branches which spring from the first achievement. The attachment by which large scenes can be reproduced, as the theater, a prize fight, or similar sights, will be followed up and completed after the first has been proved to all to be a thing of staple worth.

JOHN HESKETH AND THE CABLE BEETLES.

JOHN HESKETH is an Australian. He is in charge of important telephone and telegraph affairs for his government. A few years ago he had to meet a problem of aerial cable troubles, which had presented itself in some degree to telephone men all over the world. The temptation to come to the same conclusion which had been reached by others as to the cause of the damage must have been strong. With a belief that the conclusions were not satisfying, and a suspicion that they were reached without accumulating facts enough, or thinking about them hard enough, Hesketh attacked the problem. Beginning with only the facts of common knowledge, he directed a search for more. With these and some hard thinking he made a guess that the holes in the cables might be caused by insects of some sort, although he did not know of any forms of animal life which were fond of gnawing holes through metal. He instructed that a search be made for insects having such desires, and after two years of more or less heartless search, an assistant brought to him a beetle, a piece of cable, and a hole the beetle had bored. After this anybody could find beetles.

This story teaches that it is not wise to conclude we have learned all the facts; that it is not wise to rest content with the first satisfying generalization on even many facts, and that because some of the many types of beetles Hesketh has shown will eat cables live in this country, it is up to us to carry on the investigation in these regions.

THE COOL TELEPHONE GIRL.

THE citizen who, excited over some public calamity, only inklings of which have reached him, rushes to the telephone and because he does not obtain immediately the number asked for is very apt to think that the telephone girl is rattled by the same news that has excited him. If he were in the telephone exchange at that moment he could easily see that the operators are far more collected and self-possessed than he is. Not only are they trained to suppress their nerves, but they have a number of calm persons to steady them, something which the average citizen, anxious for news, has not at his back.

In fact, telephone girls are probably as cool and calm in times of stress as policemen and firemen are expected to be; as brokers in an excited stock market want to be; as the reporter securing facts about an explosion, a big fire, a great accident, has to be. And the latter are dependent upon whatever mental reserve force they possess, for nobody is at their elbow to steady them, while the telephone girl knows that if she becomes excited a "supervisor" is at hand to pat her on the back, to tell her to keep her nerve, not to get excited, but to buckle down to work.

A visit to any big central station would convince the most casual observer that his suspicions that his operator failed to secure him a connection because she was gossiping over the wire, were unjust. There he sees scores of hands darting here and there over the switchboard, low voices calling for "number," while up and down the aisles the supervisors keep pacing, watching the board and the lights, and ever and anon stopping to talk to the subscriber who wants to

scold the operator, and this takes up valuable time from other subscribers.

As an instance of the nerve-racking demands which may at any moment be made of a group of operators at "central" and the cool, collected manner in which these "hello girls" may acquit themselves under the most trying circumstances, the writer recalls an instance which transpired in an Illinois city during the Spanish-American war. Dewey had whipped the Spaniards at Manila; the news was in the morning papers, briefly, and by 9 a. m. everybody wanted to know the latest. The pressure came suddenly on the telephone exchange; hundreds of men were calling up their homes to give the news; people in the residence district were calling up the newspaper offices to learn the latest details; thousands of lights flashed on the switchboard at once. Telephone girls don't listen at the wires, and at first great wonder was felt by everybody at the exchange, from superintendent down, as nobody could account for the sudden rush of business. Of course, hundreds of wires became "busy" at once and the excited subscribers made the wires buzz with excited inquiries about the sea fight at Manila. Presently, as suddenly as it came, the pressure was taken off the newspaper wires and newspaper attaches wondered. It was because the telephone girls were quickly put into the possession of the facts by the proper officials of the company, and so when somebody inquired about the battle, the much-abused telephone operator quickly gave him the facts.

That the telephone company thus took up the burden of distributing the news was not only a convenience to the public, but saved subscribers' time and gave the telephone exchange opportunity to attend to the regular business, for business had to go on even though the Spaniards were defeated.

This is but one incident in scores which might be recited, but it goes to show that in times that try the nerves of men and women, and test their cool-headedness as well, the "hello girl" may be depended upon to acquit herself in a creditable and admirable manner.

SOME NEW USES OF THE TELEPHONE.

ONE of the newest innovations in telephonic usage is the communication between conductor and engineer on moving trains and the connection of the train with business houses in places where a temporary stop is made, so that passengers may talk to friends or customers without the necessity of leaving the train at all. This idea, tried as an experiment on a western road and successfully carried out in the course of a recent trip of officials of the Pennsylvania railroad, promises to come into general use on the railroads of the country.

The advantage of telephonic means of conversing with the engineer in his cab, instead of reaching him by a slow and ponderous system of signals, is too obvious to need comment. The great advantage that will appeal to the general public is the possibility of saving time by telephoning from the train to business or private houses when the cars are at a standstill in stations along the line. Thus a commercial traveler who has only a few connections in a small town and thinks he can do better by going straight on to the next, but still desires to give his customers a chance to know of his presence, can do so by having the car telephone switched onto the office telephones. While the engineer is using his oil cans in the front of the train the passengers may be talking to their business friends in the town. If it seems best to alight and stop over night the commercial men may then do so. If it appears to be only a waste of time the trip may be continued to the next town.

Still another new idea in telephone business is the calling of early toilers and those who wish to catch trains in the small hours. There is no alarm clock to beat the telephone, for it continues ringing until the sleepy one gets out of bed and stills its voice by removing the receiver from the hook. Then the operator knows that his duty is done and stops ringing. One of the telephone companies has found this branch of the business so profitable that a regular department has been organized for the express purpose of calling customers in the morning. A telephone of the ordinary kind is placed at the bedside, and the simple process of "calling" is to keep ringing at the hour agreed until the response shows that the alarm has served its purpose.

EDITORIAL ETCHINGS.

No other class has been so directly benefited by the telephone as the farmer. It breaks the isolation that has rested like a pall upon remote and scattered communities and has driven so many thousands of young men and young women into the cities. The telephone will do more to keep boys and girls on the farm than all other agencies combined, for it brings them into contact with the world without giving up the independence and freedom of country life.

Every telephone is used to call others an average of 2,500 times a year, and this also reciprocally means that each telephone is called up an equal number of times. Therefore, telephones are used on an average 5,000 times a year, almost all of which is concentrated during the busy hours of the middle of the day, and, therefore, there is little wonder these conversations sometimes interrupt each other, and that the line, therefore, is busy.

The time is not far distant when there will be a telephone exchange in every town, hamlet and crossroads in the country—practically in every home—perhaps with the power to transmit the sound of the human voice from one end of the land to the other.

The greater convenience of the telephone makes it a powerful competitor of the telegraph under any conditions. Now that it has come within reach of the farmer it meets needs that formerly were hardly suspected.

There is practically no limit to the use of the telephone, and there will be room for expansion as long as a single household, either in the cities or in the country, remains without this method of communication.

The success and comfort now enjoyed by the Independents can only be maintained so long as they continue to give good service at reasonable rates and are eternally vigilant against the wiles of the enemy.

The grandest feature about the telephone business is that, unlike other public serving corporations, a depression in financial conditions does not hurt its earnings.

A poor telephone service is better than none at all, while a good telephone service is more to be desired than diamonds and rubies.

The more one uses a telphone the more one appreciates it and comes to look upon it as the most wonderful invention of the age.

The telephone has revolutionized modern business methods and made for itself an everlasting place in the industrial world.

Good apparatus, good operators and good service at fair prices are the elements that spell success in the telephone business.

There is no safer investment than Independent securities.

The Telephone in Court Circles

There is to be an early hearing and decision of the Toledo, Ohio, telephone case. The Ohio Supreme court granted a motion to advance and ordered the plaintiffs' brief to be in by November 12, the defendants' brief by December 12, and plaintiffs' reply brief by January 10. All the cities of the state are deeply interested in the decision. As the case is filed the style is, the state on relation of the attorney general vs. the Toledo Home Telephone Company. The company is charging rates higher than were stipulated in the ordinance which gave it permission to place its lines in the city streets. It defends this on the ground that the city has no right to fix the rates a public service corporation may charge. That should be left to regulate itself just as the prices of ordinary commodities are determined. If this contention should be sustained by the Supreme court all public service corporations in the cities of the state would be absolved from their rate conditions, which most of them still recognize as binding.

Wichita, Kansas, lost out in a decision handed down by the United States Court of Appeals recently in a case that has attracted more than ordinary interest throughout Kansas. It is the final decision in one branch of the litigation growing out of the attempt of the city to terminate the franchise of the Missouri & Kansas Telephone Company. It has been in court for several years, and another branch of it now is pending in the State Supreme court, where it will be tried in November. The decision received sustains Judge Rogers, who, while sitting for Judge Hook in August, 1903, decided that the franchise had been improperly terminated and enjoined the city from interfering with the company in its work of extending and making repairs upon its lines.

The Mississippi Independent Telephone Association has filed with the Mississippi Railroad Commission a complaint against the Cumberland Telephone and Telegraph Company, and a petition for relief from the rate war, which they allege is being waged by the Cumberland against them. The petition is signed by the Citizens' Long Distance Telephone and Telegraph Company, Memphis Long Distance Telephone Company, Macon Electric Telephone and Water Company, Starkville Telephone and Power Company, Armory and Tupelo Telephone Company, Booneville Telephone Company and J. C. Cavett Telephone Company.

In a decision handed down, Judge Fisk of the District court at Grand Forks, North Dakota, holds that C. E. Burgess, being a stockholder of the North Dakota Telephone Company, cannot bring an action to dissolve the corporation in his individual name, but that he must make application to the attorney general and have such action presented in the name of the state. Mr. Burgess claims that the stockholders have converted what has been built for a telephone line into a commission house telegraph line.

On allegations that the Illinois Telephone and Telegraph Company has refused to pay its personal property taxes for 1902 County Attorney James H. Wilkerson of Chicago has begun suit in the Circuit court to force the company to pay. He demands $2,926.50.

The city officials of Wabash, Indiana, have brought suit to enforce the removal of the poles and wires of the Central Union Telephone Company. The old franchise of the company expired a year ago and the new franchise offered was declined by the company. The city holds that a new franchise is necessary to continue business and proposes to remove the company's property from the streets.

The Supreme court of Kansas has split upon the question as to whether the construction and maintenance of a telephone line upon a rural highway is an additional servitude for which compensation must be made to the owner of the way over which the highway exists. The question was brought up when the Johnson County Telephone Company planted poles in a highway in front of the farm of Michael McCann, who sued for an injunction, alleging that the company had not obtained his consent.

The East Tennessee Telephone Company has been sued by the city of Lexington, Kentucky, for $949.89 back taxes, not including penalty and interest alleged to be due upon franchise. The petition recites that the franchise was assessed at $15,217 for 1899 and $15,000 for the years 1900 to 1903, inclusive, and that the defendant failed to pay taxes for these years.

An injunction has been secured in the Ramsey county district court at Minneapolis restraining the city engineer of St. Paul from cutting down the poles of the Twin City Telephone Company in certain portions of the city. Work will be stopped until a hearing can be had.

In the Circuit court at Pulaski, Tennessee, a jury gave a verdict of $5,000 in favor of R. A. Burgess against the Cumberland Telephone Company for damages sustained by an electric shock for which, it is alleged, negligence of the company's linemen was responsible.

Andrew Thompson recently began suit against the Sunset Telephone Company in the Superior court at Seattle, Washington, for $1,000 damages alleged to be due him for having his telephone removed from his house at 403 Bell street without his consent.

Suit has been commenced in the District court at Webster City, Iowa, by the E. H. Martin Telephone Company against the Stratford Telephone Company for $500 for refusal to live up to a contract alleged to have been made between the companies.

The decision of the Probate court in the case of the Preble County (Ohio) Telephone Company against Charles Myers and others, whereby it was sought to condemn certain lands for the purpose of extending the system, favored the plaintiff.

The injunction proceedings of the Twin City Telephone Company against the city of St. Paul have been dismissed by Judge Bunn and the company given until July 1 next to place its wires in certain parts of the city under ground.

The Denver Telephone Company has brought suit against the Colorado Telephone Company for $1,800,000 damages, which it alleges is due on account of the Colorado Telephone Company causing its franchise to be revoked.

Telephone Convention Papers

INDEPENDENT TELEPHONE INDUSTRY AND SECURITIES.

While this association represents approximately $250,000,000 of invested capital, I believe few of us have fully realized our strength and ability to improve our condition by earnest and concentrated effort, but I believe the time has come when some changes would be beneficial to meet conditions as we find them to-day.

At the time this association was formed, it might be said that Independent telephony was in its infancy. The Independents at that time were operating only in the towns and smaller cities. Plants in the larger cities had not been started and practically no toll lines had been built. To-day the Independent companies, having extended to every village and hamlet, and with an Independent exchange in operation or being built in every important city but three in the United States, the problems to be dealt with are so varied that I am of the opinion (and I find many telephone men of the same mind) that a state or district association can better deal with conditions that are comparatively local, such as uniformity of rates, operating methods, municipal and state legislation, etc., while the national association, being relieved of these matters, could concentrate all its energy on the more important questions of finance, patents, and legislation. The members of the national association under this plan would be elected by the state associations, the number from each state or district to be governed by the number of telephones operated in the state. The national association would derive its revenue from the state associations and the state associations, being in closer touch with their members, would be able to secure funds much easier than under the present method.

At the present time there are organizations in most of the states, in some cases, two or more states joining in one association. There are flourishing organizations in New York, Indiana, Ohio, Iowa, Wisconsin, Kansas, Maine, Kentucky, Michigan, Minnesota, and several others that I do not recall at this moment. There is one just being organized in Pennsylvania. Assuming that such a plan is practical, I will undertake to point out where the national association through properly constituted committees could successfully cope with the common enemy.

As to patents, I think the subject is so familiar to all of us, and any cause for alarm is so remote, as to require only passing mention. I do not doubt for one moment that the Bell company and its allied interests will start suits from time to time, usually, however, against some small company in a remote place. When it starts a suit against any of the larger companies, it is for the purpose of intimidating the investors and subscribers, rather than with a view of getting a decision. We have had some experience of this kind, but have come out first best up to date.

National legislation or executive authority may have to be invoked at times to curb official discrimination. Under such circumstances, the fact should not be overlooked that there are about 250,000 investors and over 1,500,000 subscribers, to say nothing of an army of employes who are all interested in the success of the Independent telephone interests, and they are all *voters*.

The value of Independent telephone securities is not as well established with bankers and the investing public as it should be. There are several reasons for this: First, the banker is ever conservative; second, the investor usually prefers securities with which he is more or less familiar; third, the Bell interests have, ever since they found that they could not compete on commercial lines (that is to say, by giving an equally good service for the same price), undertaken to fight the Independent companies by attacking their securities, and for the last five years have resorted to every trick and form of misrepresentation known to that coterie of "frenzied financiers." (With apologies to Lawson).

Column after column has appeared in the leading daily papers of the country as reading matter (but placed at advertising rates) announcing the "failure" or financial distress of this or that Independent company. A company in the far west would be written up in the eastern papers or a company in the south in some northern papers and investigation would invariably prove the stories to be false, but the parties most interested would never hear of it until it was too late to offset the effect by having a retraction printed. At the same time, the story would have its effect on the local investing public. Another favorite method is to get a small amount of stock in some Independent company and sell it at auction or on the curb or at a low figure and have it reported under prominent head lines in the various papers, and especially some of the so-called financial papers which are subsidized by them. They have a well organized force, whose sole business is to fight the Independent companies on financial lines, either through the newspapers by wash sales of stock or bonds, by personal interviews or through banking connections. In fact, the Bell company has been so persistent in its efforts to prove that telephone securities were a bad investment, and has succeeded so well, that the last issue of bonds it offered the public were not taken. The company was compelled to make a $20,000,000 loan for three years, with bonds as collateral at about 70. This is a matter of record, as the loan was taken by Speyer & Company, and Lee, Higginson & Company.

A prominent banker and financier stated to me a few days ago that a high official of the Bell company had told him that the average cost of maintenance and operation of the various plants controlled by the American Telephone and Telegraph Company was 85 per cent of the gross receipts. My answer was, "If you have on your desk 'Poor's Manual,' or the Manual of Statistics of 1903, and will look through the reports published in either of these books, you will see that operating and maintenance are not reported in any case as over 70 per cent, and if you will note the number of subscribers in each case and add about $5 per subscriber to the net earnings, you will get nearer the true facts of the case, as the operating company has to pay about this amount to the American Telephone and Telegraph Company for royalties, which the Independent companies do not have to pay." Just as an illustration, I will call attention to the Central Union Telephone Company. Their report for 1901 indicated that they have 100,000 telephones; the gross receipts were $2,584,780; net receipts, $611,288; estimated royalties, $500,000. On this basis, we estimated their operating and maintenance at 56 per cent. On the same basis, the Chicago Telephone Company's report for 1902 was 65 per cent; The Cincinnati (Bell) Company, 54 per cent; Cumberland Telephone Company, 50 per cent; Hudson River Telephone Company, 54 per cent; New York and New Jersey Telephone Company, 58 per cent.

The banker and investor does not seem to understand that these enormous royalties of something over $3 per telephone, according to American Telephone and Telegraph Company's report, besides royalties on switchboards, come out of the profits, and are charged up by them as an item of maintenance and operation.

Another investor had had it pointed out to him that the telephone business was a bad investment, as they were constantly needing new money; that the plant was never completed, and it was necessary to make an additional investment from time to time. My reply was, "That is true, but you are heavily interested in electric lighting, gas, and trolley roads, and I have just been informed that you are making extensions to every one of those plants." This is a condition that has to be met in every form of public service, and if the plant did not increase with the population, it would denote an unhealthy condition.

I remember a few years ago, when electric lighting was new, the gas companies throughout the country were very much alarmed at the advent of electric lighting. They feared that it would ruin their business and their association did everything in its power to curb its growth. Most of the bankers either owned or held as collateral some gas securities and the fight waxed warm, but the electric lighting companies were unable to place any securities, except as they could interest some local capitalist in each town, and the manufacturer usually had to build the plant, and carry the purchasers largely on notes until they could earn the cost of plant out of the property. After five or six years, the investing public changed their views entirely, and electric light securities, in fact, went to the opposite extreme—plants that cost $50,000 were often bonded for $75,000, and sometimes $100,000!

It is to be hoped that this condition will never prevail in the telephone field, as the opposite extreme is as bad as the first. The gas companies have ceased to look upon the electric light companies as direct competitors. The experience of the early promoters of trolley roads was similar to that of electric light, as the trolley road, requiring an expenditure usually of a large amount of money, could only be financed in large money centers. At such points, the steam railroad interests were able to intercept and prevent them from financing, through their influence with banks and bankers. This condition has passed. In the east, we find the trolley road paralleling a steam road at nearly every point and the securities of trolley roads are generally considered first-class.

I am not one who believes that the Independent interests will put the Bell out of business, or that the Bell company will put the Independents out of business. I believe the public demands competition. In the east our average annual receipts per telephone are about the same as the average received by the Bell companies. I do not know of a town or hamlet in Pennsylvania that has not both systems.

In eight years' time the Independent telephone movement has made such strides that to-day it has more exchanges and more telephones than the Bell company, which has been in business since

1878, and up to date, approximately $250,000,000 of capital has been invested in constructing 6,000 exchanges and installing, approximately, 1,600,000 telephones and that the only point wherein the Bell company excels is in its capitalization per instrument. I quote from "Telephone Development," by Vinton A. Sears of Boston, which is as follows:

Capitalization per subscriber (Bell Company).....$417
Capitalization per subscriber (Independent Company)..... 146

This should be convincing proof that this great industry is on a sound financial basis and is here to stay. The policies of the Independent telephone companies are not dictated by hired officials, nor are their properties managed by employes who have no further interest than the drawing of salaries. The Independent companies are almost invariably owned right in the community where they are operated. They are financed and managed by business men of standing in the community. I consider telephone securities just as good an investment and just as safe as trolley roads, gas, water, electric lighting or *any public utility*. Some of us may be mistaken part of the time, but we can't all be mistaken all of the time, the Bell company's statements to the contrary, notwithstanding.

I believe the most important duty that the national association has to perform now is to organize a bureau, and provide ways and means of sustaining it, the duties of which should be to disseminate the truth, correct misleading statements and refute misrepresentations.—*Paper prepared for National Independent Convention at St. Louis by Charles E. Wilson, general manager of Keystone Telephone Company, Philadelphia, but omitted from the programme by error.*

MINNESOTA INDEPENDENT TELEPHONE ASSOCIATION.

According to our constitution this association was organized with the following objects:

First—The protection of Independent telephone interests and those of all the members of the association.

Second—The protection of subscribers to telephones, and the apparatus operated by members of the association.

Third—The promotion and construction of high grade exchange systems and long distance lines.

Fourth—The securing of just and the prevention of unjust legislation affecting the rights of telephone companies in Minnesota.

Fifth—The promotion of a complete intermunicipal communication and long distance trunk lines throughout the state.

Sixth—The bringing about of uniform charges for toll and rentals and a proper division of charges between lines of the association.

In regard to the first, how can the interests of Independent telephone companies be protected? From whom and from what do they need to be protected? This is a fruitful subject for consideration at this time, for I have no doubt that there are many Independent companies in Minnesota that are not aware that they need any protection. They have not waked up to the fact that Independent telephony has been or is at present in any danger whatever.

That this clause is in the constitution would go to show that its framers at that time thought otherwise, or else it would never have been inserted, I am sure.

Let us see. Two years ago it was asserted that the manager of the Bell company in this state had said that it was no longer a telephone competition in Minnesota, but a telephone war. Six years ago the Bell people would not connect with an Independent company except on the following conditions—viz., that the company discard all Independent telephones and use only the Bell, asserting that these were the only telephones that would talk on long distance lines, and that, therefore, it would be useless to connect because it would be to the injury of their long distance service.

This edict compelled the Independents to commence the erection of toll lines. Menaced in this manner the Bell changed their tactics and greedily made traffic arrangements with some of the larger and stronger of the Independent companies and purchased their toll lines and agreed not to enter their territory for toll purposes during the life of these contracts. By this means they cut off many of the smaller companies from connections with surrounding towns. Thus the Bell began to stifle and throttle such Independents as they did not wish to make their allies. By these means they hoped to crush those ambitious exchanges that had dared to enter the field in opposition, such as the Twin City, Mankato, Winona and Duluth, and render them unable to obtain toll lines or connections, and that they, therefore, could not long remain in the field, inasmuch as the Bell also in these places reduced the rates below actual operating expenses, by giving free telephones in homes wherever they could get subscribers of the opposition to keep or put one of theirs in their place of business. Was not this a danger? Is it not still a danger? But have you noticed a single Independent company that has gone out of business in consequence?

Added to this the Bell have since purchased some exchanges where the competition in surrounding places was strong or they have absorbed some of their allies with whom they were connected, paying exorbitant prices for what they got, because they felt that these exchanges were in these localities the key to the situation.

Yes, we were menaced, and the battle is still on. The Bell, with their millions wrung from the people, are spending some of it in the warfare to the death against Independent telephony. Defeated in the courts of last resort, at almost every turn, they are now continuing their warfare by spending more of these millions in the purchase of Independent manufacturers, in purchase of the press and by the use of printer's ink in the way of distributing their lying pamphlets broadcast wherever an Independent company dares to attempt an organization or to secure a franchise, and by their paid agents who present counter-propositions and opposition franchises wherever one is sought in opposition by an Independent company.

Fully cognizant of these intentions to kill all opposition, no matter at what cost, many Independent companies in Minnesota are aiding and abetting them in their efforts, believing that by so doing they are safe and that no harm can come to them. If I could safely prophesy the ultimate success of the Bell in their unscrupulous efforts, then I should say, wait and see how ruthlessly these hopes are shattered. This, however, I cannot do, for I believe that alliance will sooner or later react upon themselves and that the Independents are eventually going to win. In fact, I believe they have the battle already as good as won, and if they can hold the ground already gained, then all past effort of the Bell has simply delayed, but has not in a single instance driven an Independent from the field.

I said that we had been menaced by the newspapers, who, with but few exceptions, so far as I know, have ever had a good word for us, fearing that if they did espouse our cause they would lose their advertisements and the franks so liberally furnished by our enemies.

We have been menaced by Bell lies sown broadcast, tending to throw discredit on Independent investments. In these some failures have been cited to uphold their contentions. But do you know, gentlemen, that there have been more bank failures in the past six years than there have been Independent telephone failures? Do you know that the Michigan Bell failure was ten times greater than all the Independents put together in the past six years? When we think of the inexperience of almost every Independent company entering the field and of the millions of Bell money spent in fighting them, is it not strange that there have not been more failures? When we remember that for the past two years there have been from fifty to one hundred Independent telephone companies organized every month, and that to-day there are more Independent telephones in operation than the Bell have with their twenty or more years of service, against seven of the Independents operating, and that more money is invested in Independent property than there has been of the Bell, we wonder.

Again, when we remember that there are but few of the large cities in the country that have not competition with the Bell and that the time is almost here when trunk toll lines will have been completed between all these cities, the wonder still grows. Do you know that but for the so-called Independent help they now have in Minnesota that the Bell would be practically out of business in the state? Do you know that if all the Independent companies in the state were banded together, and all working for mutual interests, there would be no need whatever for the Bell within our borders? Do you know that the Independent companies in the state that are not so banded are their own worst enemies? I believe it. What can one of us do alone against the machinations of the Bell? What can we not do banded together in an association like this and working in harmony?

It is my belief that the allies of the Bell are more to be feared than the Bell themselves. It is the main object of this association to meet the attacks of our enemies to ward off bad results of their maneuvers and to save the Independent field for the Independents themselves, and to do this we need the support of all, and we need money as well.

Are we doing anything along this line? Have the few who are banded together to fight these battles done anything substantial during the past two years? Let us see. The constitution also says this organization was formed to protect subscribers to telephones and apparatus, operated by members of the association. I regret to say that the association as such has not contributed in funds to the fight that was made against the Bell to prevent it from demanding royalty from every Independent company operating an exchange, because in the first place we have had no funds to appropriate for such purpose, and in the second place funds from others had already been contributed to pay the costs of the long-drawn-out litigation brought by the Bell. But do you know, gentlemen, that but for just such organizations as this, which did lend their influence and help with that of the manufacturers of Independent apparatus, you would all be paying royalty to-day?

Do you know that the few members listening to your calls for toll lines have within the past two years, or a little more, built some 600 or more miles of trunk lines? The Bell have not been idle during this time, either. Foreseeing the influence that we as an active organization might bring, they immediately after our first meeting got busy and made new contracts where they could, even extending them to ten years in some instances, practically giving free use of their own telephones where they could get them installed with a company for five years, with a lease thereafter and an option on the plant.

One of the first companies to sign contracts with the Bell, I am

told, has lost three of its exchanges, and is liable to lose more. One of its most successful exchanges two years ago lies idle without a single subscriber, where it formerly had about 100, I am told. Others are in disgrace because of having adopted the arbitrary ways and methods of their boss, the Bell. Had these companies remained loyal to the Independent cause, they would have been to-day among the strongest among us, and with proper management would have been prosperous. Gentlemen, we all need toll lines, and the toll lines need us. Men whose hearts and money and time have gone into this work need your encouragement and support, and without it it will all have gone for naught. Encourage them by your talk, your influence and your money, if need be, thus building up your own section and the other Independents in the state by keeping your money in circulation at home instead of paying tribute to Boston.

The bringing about of uniform charges for tolls and rentals and a proper division of charges between lines of the association is a very much needed matter for discussion and action, and I trust that our committee appointed to investigate and report will have formulated some plan that can be agreed upon at this meeting. These charges are at present by no means uniform with the Bell, for wherever the Independents have gone rates have been cut, and are still being cut, by them, and the balance of their field has to pay tribute. You can talk a hundred or more miles on some of their lines for 20 cents, while on some others it is only twenty miles.

Another menace is that where one year ago they would not connect with a farmer line under any consideration, they now solicit their patronage, and one president of a company told me last winter that one of the officials from Minneapolis had been to see them at least a dozen times, with almost as many propositions. They have even solicited our farm subscribers by letter, trying to induce them to build their own lines, offering to assist with plans and specifications, furnish materials, rent them telephones and give free service with their exchange and with all their farm connections. Thus you can see to what straits they are driven. Unable to get a market for their old and their surplus telephones, they are trying now to get the farmers to take them and are using all kinds of sophistry to accomplish it.

Six years ago when the Mankato Citizens' Telephone Company started to build they said that in five years there would be but one exchange in Mankato, and they would own it. Reduced rates, free telephones in many instances, cutting us off from all toll connections, have only resulted in increasing our patrons from 250 at that time to 800 subscribers at the present time, and 125 miles of toll lines of our own and 125 miles of rural farmer lines and connection with at least one dozen other farmers' lines, and also the building of a trunk copper line from Worthington to the Twin Cities. This line will connect at Worthington with the Sioux Falls lines now being erected to Yankton, Mitchell and Sioux City. Thus you see in spite of the prognosis of the astute Bell manager we are still on top of the earth, and so far as present prospects go our demise is some distance in the future; we may outlive our franchise. I am very sure we will all do this if we pull together and lend each other our moral support. Thus you see that the association members are fulfilling as fast as possible section five of the constitution in promoting a complete system of long-distance lines.

Few we are, but I do not believe there is another state that has done better in the same length of time than we, in building first-class long-distance lines.

There is another menace to Independent telephony in Minnesota and it is important that we look after it and appoint an active committee at this meeting to see that legislation in regard to Independent telephone interests is properly scanned and looked after. I have had it intimated to me that the coming legislature would have some bills presented and it is important to know from what source these do originate.

How many of the members of the last legislature carried Bell franks do you suppose? How many judges of the courts, how many newspaper editors, congressmen? During the last campaign the wife of one of them told me that her husband had free coupons sent him by the Bell company and told him when they were gone to send for more. Is this not a menace? What do these people expect to get for their great generosity but the good will and assistance? What instigated the regulation of the postmaster general in ordering out the Independent telephones from the postoffice and the installation of the Bell but this and money interests?

Gentlemen, I plead for unity of purpose and loyalty to this organization. Though we are at present but few, we have a great work before us, and by working together we can do much. We need a strong and prosperous organization, with plenty of funds so that we can employ capable men when necessary to counteract the influence of Bell paid agents when they try to bulldoze, frighten or cajole our friends. I have in my possession information of some acts of our enemies that would put to shame a St. Louis alderman. Fortunately for us their machinations in this instance came to naught, but it was not from any lack or endeavor on their part, but an accident of special providence which defeated them.—*Paper by Dr. J. H. James, written for Minnesota Independent Telephone Convention, at Minneapolis, August 31 and September 1, 1904.*

LONG-DISTANCE LINES.

This is a subject that could well be subdivided into many separate papers, and your committee not having requested me to adhere to any one line, I take it that it is their intention to have a paper touching on the subject in general, rather than on any one special branch. A paper on the subject as a whole, would be rather lengthy; therefore I will confine my remarks to a condensed review of the subject. This is a time-worn subject at best. That it is by all odds the most important one to us, as operators, is evidenced by the fact that every one of us will acknowledge that our success or failure depends in a great measure upon whether or not we heed the many pleas made for better long-distance lines. We all know that a chain is no stronger than its weakest link. We all know where to look for the weak link, and most of us know that it is the long-distance line end of our business that is by far the weakest.

This subject has been up before nearly every Independent telephone association meeting throughout the whole country; and so much has been said already on the subject that there is comparatively little left to say, along any new line of thought. First and foremost, "long-distance lines," to be deserving of the name and the patronage of the public, must be exceptionally well constructed. There are plenty of good instruments; some of them bad; not so with long-distance lines, for the rule works the other way in this respect—viz., some of them good, more of them bad, or plainly speaking, utterly useless, from a commercial standpoint. This state of affairs is the direct result of inexperience, coupled with the desire to reach out and cover the territory first, with no view looking toward permanency or high efficiency.

To profit by this past and costly experience, all true Independents should build their new lines strictly in accordance with standard specifications, for the action of any one Independent has its visible effect on the use of Independent lines in general. That we are unable to offer competition on messages of over one hundred miles is the exception rather than the rule. There are a few companies doing it, however, with good service, but more of them cannot, with the present poor class of construction and round-about routing. The company furnishing the most satisfactory long-distance service is the company that gets this class of business, regardless of its rates. If this were not true, the opposition would not be in operation to-day.

A local subscriber to an exchange is very well satisfied with a low rental and his local service, but when it comes to long-distance service, he is, as a rule, very different, for almost unknowingly to himself he will pay double the price for satisfactory service. To-day, when a man has a long-distance message that he cannot get through on an Independent line, he usually resorts to the opposition or the telegraph, thus proving that he would as a rule pay twice the price for good service if we were on the ground with the goods.

Someone has said that the Independents could not afford to build long-distance lines, according to standard specifications; the argument being that the receipts would not be sufficient to provide for maintenance, operating, depreciation and a fair return on the investment at the present low rates. This is all wrong. For it is a rule that holds good in all things—viz., "If you have the goods you can get the business."

Apropos of rates for long-distance service, a good plan is to follow the older public utility companies—viz., the water, gas and electric enterprises—by adopting a sliding scale to fit the larger users—that is, make a straight rate up to so many messages, and for all over that amount sent during any one month, a discount of so much is given the sender.

In connection with this plea for standard construction of long-distance lines, I wish to call your attention at this time to an item of interest, recently noted in one of our Independent journals. The substance of the item is as follows: Some years ago a certain well known railway company constructed a long-distance telephone line from Omaha to Chicago, and from thence to St. Louis, using No. 10 copper wire, being assured that this size was sufficient for conversations up to 1,000 miles. As a matter of fact, it has been found that in practical use, 400 miles was the limit of satisfactory talking, and now at a great expense, the circuit will be rebuilt with No. 6 copper.

I will not take up your time by asking you to listen to a monotonous recital of what constitutes a standard specification for the construction and equipment of a long-distance line, for all of you no doubt have your ideas regarding what is necessary to build good lines. It is not our ignorance regarding specifications covering the construction of good long-distance lines that keeps us from building them so, but our short-sightedness, even false economy, in our unwillingness to make the additional investment necessary to bring such lines up to standard.

I believe you will all agree with me when I say that as an ideal solution of the long-distance line proposition, if one long-distance company could own and operate the really through long-distance lines, giving each individual operator connection at some convenient point, our troubles along this line would cease with their advent. But, since it is not likely to happen that way, I would suggest the next best thing—viz., build good lines yourselves.

I wish to say a little something regarding the division of tolls.

The keep-all-you-get system is away out of date, and unfair to some. A more equitable system would be some sort of traffic arrangement. Possibly the best solution of the problem would be a clearing house system, such as is now established in the state of Wisconsin. As I understand it, the system works this way:

All reports are made to the clearing house, the traffic manager of which issues sight drafts on the particular party owing each month, in favor of the crediting company. No money passes through the clearing house. All settlements and divisions being made on the air line mileage basis, at a cost of not to exceed one cent per message. To my notion, there would be more money in it for the operating companies than the present haphazard, go-as-you-please system, which system should have been obsolete ere now.

Finally, until such time as our long-distance lines shall be built according to standard specifications, supervised and cared for by men of ability, our rates adjusted with a view to uniformity, the keep-all-you-get system abolished, and a satisfactory arrangement made for the settlement of long-distance business, just so long will this important branch of our business suffer.

Then altogether, from the present moment, let us leave this convention with happy remembrances of the friends we have made and the great good we have gained from these associations, and last but not least, with a firm resolve never to build another inch of long-distance line, not up to the standard, and of which the community which they are in could not be justly proud.—*Paper read by Z. G. Houck at Northwestern Iowa Independent Telephone Convention, at Independence, Iowa, September 8 and 9.*

ARE OUR RELATIONS WITH THE FARMER IMPROVING?

When your secretary requested of me a paper upon this topic, I notified him that I was not competent to treat the subject in the broad or general way it should be done, but that I would attempt to do so from the standpoint of the conditions of our exchanges. I presume this topic has been assigned me for the reason of our exchange having passed through some experience with its rural patrons that should cause me to be especially prepared in this direction.

Some present at this meeting will recall the session at Cedar Rapids one year ago, and that we were called upon, and our president and manager, Mr. Whitacre, made a statement, the substance of which was that West Liberty was surrounded by a network of rural party telephone lines, owned by rural parties, connecting at the corporation line with our central exchange, and were paying us a monthly rental of 50 cents per telephone. That an effort had been made by holding several mass conventions to organize and combine all these for the purpose of securing a reduction of 50 per cent in rates, or, failing in this, to form a company and operate a mutual exchange. It was stated at that time that we had declined to grant their request and that we considered the matter as pending and that further efforts and movements upon their part were to be expected.

I am pleased to report that nothing further has developed, that we are inclined to believe the matter now settled, and further, that a better feeling than formerly now exists. It is what I consider has brought this about that may prove of interest and benefit to the members of your association, and I will attempt to recount some of it. We decided, first of all—not to resent in kind the abuse that was being heaped upon us. We decided we must make it what politicians call "a campaign of education."

They must be made to understand that all the burden of operation, in time, trouble and expense, was upon us, and that it was costing far beyond their estimates to operate for them. That their investment of from $25 to $40 each, from which they never expected to receive other compensation than the use of their apparatus, was not to be compared with that of thousands of dollars, invested in an exchange system, only and solely for the purpose of the revenue that could be derived from it. That they must take into consideration those great items—renewals, repairs and depreciation—which telephone companies are compelled to meet, and which they were losing sight of. We also decided not to be drawn into public discussion or newspaper controversy if possible to avoid it. We were able to follow very closely the lines of defense thus mapped out. One of the first things done was to write perhaps one dozen of the exchanges around us, asking a series of questions, such as "Do you own rural party lines, or are they owned by the farmer?" "What are your rates?" "Are they satisfactory?" "Regardless of what you are now doing, were you to commence again, what would you do?"

We then stated our conditions and rates and the demand that was made upon us and asked their advice. To each we received a prompt and courteous reply. Your secretary contributed one that we valued very highly. A brief summary of these would show that some owned all rural lines, some owned a part of the rural systems, some, like ourselves, owned none; rentals or rates varied equally as much, from 25 cents to $1.00 per month. Those accepting the least named price stated that they were under pressure or threat and were not satisfied, and they universally advised us to stand firm and not to yield, that our rate of one-half the customary exchange rental was not excessive. This series of letters was very helpful and encouraging to us and we made good use of them. I wish to speak particularly of the first use we made of them, which was with the newspaper men. We thought we saw a disposition on their part to be carried away with the clamor against us. We called them to our office and stated to them that we had no favors to ask, no muzzle to put on the public press, all we expected and wanted was fair treatment, and asking if they were going to take their position without hearing both sides. When assured they were unprejudiced, we showed them records of expense, gave the number of employes and salaries, explained and made plain the trouble and work it was causing us to operate these rural lines, and as often as any trouble occurred with the rural party line we were expected to at once send a lineman to the pole at the corporate limits to hunt the trouble, which was most often upon their own lines. We then produced this series of letters from other exchanges that I have just spoken of and when they had read these we wanted to know, "Now what would you do under the same circumstances?" It had been suggested that we ought to yield for the sake of harmony and for the interest and good will of the town. We wanted to know of the newspaper men if they were ready to reduce subscriptions and advertising rates 50 per cent and if the merchants would cut prices on merchandise 50 per cent for the good of the town. Why should the telephone company be singled out to make all the sacrifice? I wish to say that thereafter we could have no complaint of the press.

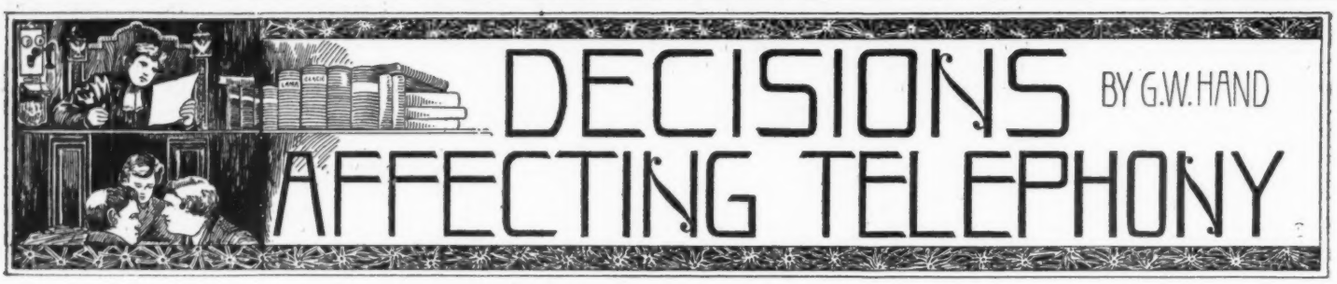
Then one of the leading agitators had published the statement that it was no more trouble for our office to operate for their rural line of ten telephones—which paid us $5.00 per month—than for a certain exchange patron at the corporation line, who paid us $1.00 per month. We challenged this statement and our manager made a test of the matter, and unbeknown to any person outside of our office, a record was kept for three following days, the result being that our resident patron sent in three calls, his drop on our board falling that many times, the rural drop falling 88 times, 37 of which were calls to our central office. At my suggestion, the test was continued for the next three days, using another party line which came in over the same poles, the result being that our resident drop fell six times, the party line drop 92 times, 40 of which were central calls. The results were not at all surprising to us, and our operators asserted that only the usual conditions prevailed during the test.

We made considerable and good use of these tests. Several rural lines had builded into a neighboring village, too small to support an exchange, and a merchant of the place had invited them to run into his store and he would switch them together, without pay, and they accepted. After a time they complained that the service was far from prompt. The merchant responded that he could not afford to neglect a valuable customer to wait upon them, and told them to move out. They then moved their switching office to a private residence, but the parties who operate for them require and receive two cents for each call or switch.

By our test, we were able to show that our service was extremely low, that if these rural party lines we had tested had run to this village, their 37 and 40 calls would have cost respectively 74 and 80 cents, while they were paying us but 50 cents for an equal amount of service, less than two cents per day for each rural patron on the line, and in addition they had not been limited but could have called as many times as they chose, without any additional cost to them or complaint by us.

I have stated that a better feeling than formerly prevails, and I am convinced this is the case, and can readily attribute it to the rural patrons having gained a better knowledge of the telephone exchange business. These people living in the country surrounding West Liberty are as intelligent, fair and just as can be found anywhere. They are equally as enterprising, progressive and successful, as evidenced by their well kept, beautiful homes, the quality of their live stock, and the "turn out" with which they drive into town, which put to shame many of the professional liveries; their telephone systems, which lead out upon every highway and into almost every farm home. It is very gratifying to the members of our company to have learned that a less number than we had thought were associated with the movement and that some rural companies were not even represented in it. We believe they are convinced that our business is fairly and honorably conducted, and that they are not paying us an unreasonable price for service.

Our president, who is also our manager, is deserving of great credit for the manner in which he has dealt with the many difficult problems which he, more than any of the rest, has had to meet. He has had his opportunity when they have come to the office, and has been at great pains to explain and set right very many of the misunderstandings. As a company we have tried to treat the matter fairly, firmly and diplomatically. Only once have we had occasion to resort to the public prints, and that was to answer one who had fairly called us out and was deserving of a reply. When the rural party line patron becomes satisfied and the exchange is satisfied, it becomes very apparent that "our relations are improving."—*Paper read by A. H. McClun at the Northwestern Iowa Independent Telephone Convention, at Independence, Iowa, September 8 and 9.*



ACTIONABLE NEGLIGENCE EXISTS ONLY WHEN COMPANY OWES INJURED PARTY A DUTY.

Various kinds of personal injury cases against telephone companies have been before the various courts of the country of late, but perhaps no one more interesting than a case brought against the Cumberland Telegraph & Telephone Company in 1903. This company had secured by purchase or otherwise the telephone lines at Roland, Kentucky, one of which ran over the roof of a porch of a store building, and within two or three inches of coming in contact with it. The roof was of metal and at the time of the accident referred to was wet. One Walter Martin took refuge under this porch to escape a storm and while waiting thereunder lightning struck the telephone wire some 600 feet from the porch and was conveyed over the wire and through the roof, killing Martin instantly. Action was brought by the administrator against the company to recover damages for his death. At the trial the evidence showed very clearly that the wire across the building was negligently constructed and that there had been requests made upon the company to remove the dangerous wire, which had been unheeded. The fact was also established that Martin was merely under the porch for his own protection and had no business in any way in connection with the company, or with its servants or agents. Martin had merely an implied license to go under the porch to avoid the storm. Several cases were cited, among them a railroad case (23 A. M. Rep. 751) in which a person out of employment went into a passenger station of a railway for pastime, and the building being negligently constructed, it fell during a storm and killed him. The court said: "It is doubtless true that a railway company by erecting station houses and opening them to the public impliedly licenses all persons to enter, but it is equally true that such license is revokable at the pleasure of the company as to all persons who are not there on business. An implied license to enter a depot creates no *additional duty* upon the part of the company as respects the safety of the building entered. Its only effect is to make that lawful which, without it, would be unlawful."

As above stated, the court in the Kentucky case decided that the deceased party had a mere implied license to go under the porch, but he had no business at the store and went under the porch to get out of the rain for his own convenience. "The owner of the property was under no liability to him to keep it safe. If the telephone company had owned both the wire and the building, it would not have been under any responsibility to the deceased for his injury, although he was under its porch by its implied consent, as he was there as a bare licensee, for his own convenience. If the telephone company would not be responsible if it owned both the wire and the building, it is certainly under no greater responsibility when it owned only the wire. If it had put its own wire negligently on its own building, and thus endangered its being struck by lightning, it would be responsible to those it invited to the building in a dangerous condition, but it would not be responsible to those merely using it for their own convenience as a shelter in a time of storm. When it put its wire negligently on another person's building, and was negligent in securing it, it violated its duty to him, but it violated no duty to those to whom neither he nor it were under any obligation. We therefore conclude, for the reasons stated, the plaintiff made out no cause of action against appellant."

From the above discussion the following rule of law is adduced: That a telephone company is only liable for injuries caused by electricity being conveyed over its wires when it owes some duty to protect the person injured, from injury. If this condition is wanting, regardless of the negligence displayed by the telephone company, no action can be sustained for damages.

Cumberland Telegraph & Telephone Co. v. Walter Martin's Administrator, 63 L. R. A. 469.

CONSTRUCTION OF CONTRACT.

The Lebanon L. & L. Telephone Company and the Campbellsville Telephone Company of Kentucky connected their lines by extending them to a point midway between two cities, in one of which defendant maintained an exchange and in the other of which plaintiff maintained an exchange, and it was provided that each company should have the right to send messages over the extended line between the two cities, and for more than eight years after the extension was made messages originating elsewhere than in the two cities were received and passed over such line. The Kentucky courts have held in a suit between these companies that in view of the situation and the practical construction given the contract by the parties, it should be construed as calling for the transmission of messages, irrespective of whether they originated in either of the two mentioned cities. It was further held that the duration of the contract to exchange messages was the corporate existence of the two companies and it was not determinable at the will of either.

Campbellsville Telephone Company v. Lebanon L. & L. Telephone Co., 80 S. W. 114.

RIGHTS ACQUIRED IN CONDEMNATION PROCEEDINGS.

It has been said in a recent case against the Postal Telegraph-Cable Company that the easement acquired by a telegraph company by condemnation proceedings in the right of way of a railroad, embraces the land actually occupied by the poles and fixtures for guy wires, and the right to stretch the wires on the poles and to enter on the right of way to construct and repair the telegraph lines, and this is the only exclusive right of way of occupancy that the company thus acquires. It is further said that the appropriation to a public use of the right of way of a railroad is a withdrawal of the right of way only for the use to which it is to be put under the terms of the petition for condemnation of the railroad right of way. The rules of law thus declared are equally applicable to telephone companies.

Atlantic Coast Line R. Co. v. Postal Telegraph-Cable Co., 40 S. E. 15.

COMPANIES ARE COMMON CARRIERS IN SOUTH CAROLINA.

Complaint was made against the Citizens' Telephone Company before the Spartanburg county court in the above state alleging that one J. B. Gywnn had made demand on the company for the use of a telephone in his store, but that the defendant "negligently and willfully failed and refused plaintiff the use of said telephone" unless plaintiff would consent

to a prohibition against the joint use of the Bell company's telephone. This the plaintiff refused to consent to and owing to the loss of the use of the Citizens' telephone his business, in his judgment, had been damaged $2,000 worth. The defendant company alleged that at the time the demand was made upon it by Gwynn for telephone service its wires and switchboard were all in use and that Gwynn was not alone in being denied a telephone; that it could not supply the telephone asked for. As a counterclaim the telephone company set up that Gwynn had some time previous to the bringing of the suit entered into a contract with it to use the Citizens' telephone exclusively, but that shortly before February 8, 1900, the plaintiff had rented another company's telephone and had it installed in his premises to the damage of the defendant in the sum of $2,500.

The following propositions were discussed by the Supreme court of the state in disposing of the case: (1) Are telephone companies common carriers in South Carolina? (2) Are contracts between telephone companies and their subscribers, that the latter will use the service subscribed for, exclusively valid? (3) When are punitive damages allowable for failure to install service? In deciding the first proposition the court cited Gwynn v. Citizens' Telephone Company, 85 Am. St. Rep. 870, which it said was a leading case and decided the question affirmatively. In this state, therefore, companies are bound by the rules governing common carriers and must furnish service to all alike who comply with the reasonable regulations of the companies. The court said that contracts made with subscribers, by which an agreement is reached that the subscriber will use no other telephone than the one subscribed for, are entirely void, as being in restraint of trade and against public policy. Punitive damages are allowable only when there is misconduct and malice and a tort committed by mistake in the assertion of a supposed right or without wrong intent, will not warrant exemplary damages. On the ground of error by the trial judge in charging the jury the court sent the case back for a new trial after stating the law applicable to the controversy.

Gwynn v. Citizens' Telephone Company, 48 S. E. 460.

TAXATION OF COMPANIES BY STATE LAWS EXISTING UNDER FRANCHISE OF FEDERAL GOVERNMENT.

A recently decided case against the Western Union Telegraph Company brought by the state of Missouri is a very good discussion of the question involved in the above statement. The Western Union company exists under the laws of the state of New York and operates in that state by authority of a New York act of incorporation. Outside of the state the company has authority, by virtue of an act of the Federal government, passed July 24, 1866. The state of Missouri had levied a tax on the fixtures of the company in the state amounting to $1,027.22 in Jackson county, which amount was made the basis of a defense to the collection of the general amounts throughout the state, the principal ground being that the state board of equalization, in estimating the value of the properties of the company within the state, had included as one of the items "the franchise and value thereof," which the company claimed was not taxable, and pressed strongly the argument that it was a tax upon the franchise of the company, which franchise, being derived from the United States by virtue of the statute above cited, could not be taxed by the state. The Supreme court of the United States, to which the case was finally carried, has decided adversely to this contention, and in citing a Massachusetts case (125 U. S. 530) said that the privilege of running lines of wires over and along the post roads of the country was granted by the act of Congress, but that the statute was merely permissive and conferred no exemption from the burdens of taxation; that a state could not by any specific statute prevent a corporation from placing its lines along the post roads of the state or stop the use of them after they had once been erected, but that in consideration of the fact that the company receives protection under the state law, the state could in return levy and collect a tax from such companies.

Another point of interest was discussed by the appeal involving the remedy to be employed by a company contesting an assessment of what it believes to be illegal taxes. The Western Union company had wholly refused to pay any part of the taxes assessed, on the contention that they were illegal on the further ground that the sum asked was grossly in excess of a fair and just amount in proportion to the value of its properties, in comparison with other property in the state. The company had sought to defeat the levy by an action at law which the court said was an incorrect method. "It is only where the assessment is wholly void, or where the assessment has been set aside as invalid, that an action at law will lie for the taxes paid." Ordinarily where over-valuation is the basis of the claim for rebate or reduction, a bill in equity is the proper proceeding. This remedy the Supreme court said should have been used in the suit. The first thing to do is to tender the amount that is justly due and begin a proceeding in equity to set aside the excess.

Western Union Telegraph Company v. State of Missouri ex rel Collector of Jackson County, 23 S. C. R. 730.

TELEPHONE RULES.

A Toledo, Ohio, correspondent who signs herself "Hello Girl," has sent the following list of "telephone rules" to TELEPHONY with a request that they be published:

If you have a telephone in your office or store, call up "central" and then go wait on a customer.

Take your time in answering your bell, or what is better, do not answer it at all, but in about a half hour ring up and ask who called you, and get mad if "central" has forgotten who it was. She has nothing else to do but remember.

Hang up your receiver big end up, as in this way it gets full of dust.

Bang the transmitter with a lead pencil as though you intend to knock it through the wall. This invariably makes it talk better.

When through talking drop the receiver or throw it down. This allows the batteries to run out and breaks the strands in the receiver cord.

Open the generator box with a knife or an axe and take a look at things. If the interior does not look right pull out a few wires and leave the door open. This improves the service wonderfully.

Throw a metal inkstand, etc., on top of the telephone which will short circuit your instrument, then go to sleep and no one can call you.

Never "ring off" when through talking, as that would notify "central" you had finished. Let her guess at it.

Never speak kindly to the operator, as she is more used to being called names.

If the party you call does not answer, put the blame on "central."

Paste this on your telephone for future reference.

There are nearly 5,000,000 telephones in operation in the United States, and this figure is being increased at an enormous rate. This vast number of telephones is divided between the Bell and the Independent companies, in the proportion practically of one Bell to two Independents. These startling figures demonstrate the hold which the telephone business has upon the commercial and social life of our people, and the marvelous growth of the Independent movement.

Telegraphy and Telephony in Japan

SAITARO OI

TELEGRAPHY, as in all other countries, is also the oldest and was the first practical application of electricity in Japan. It is generally believed that Commodore Perry of the United States, when he came over to Japan in 1854, brought two sets of telegraph instruments with him and presented them to the Shogun (at that time the lieutenant general, or governor general, of the empire). The first telegraph line, however, was constructed between Tokyo and Yokohama in 1869, the instruments used being Bréguet's instruments, which were employed for some time until all were superseded by Morse inkwriters. There was not very much progress until 1877, when the civil war broke out in the southern districts; this naturally necessitated an increased use of the telegraph and the lines were extended to the important places of the empire. These thirty-six years from 1869 to 1904, have wrought a remarkable change in our social conditions in general, and in the domain of means of communications for the public some progress has been made. In order to show the progress made, during these thirty-six years, I give the following table:

STATISTICS OF JAPANESE TELEGRAPH AND CABLE LINES.

Year	Miles of land lines	Miles of wires	Nautical miles of submarine cables	Miles of aerial cables	Number of telegraph stations	Number of telegraph instruments in use	Number of messages charged	Expenditures in yen (1 yen = 50 U. S. cents)	Receipts in yen
1869	20	20	.....	.....	2	.....	.....	.....	.....
1880	4,140	9,782	52	.....	155	.....	1,897,695	785,901	896,571
1890	5,890	19,800	121	.....	408	734	4,039,319	1,386,381	1,256,155
1900	14,735	66,834	2,031	.....	1,654	2,817	14,280,230	5,773,492	6,062,990
1903	16,600	80,213	2,178	10	2,178	4,216	16,987,760	6,234,738	6,567,187

It may be remarked here that about 3,000 miles more of wires are to be added to the existing lines this year so as to meet the increase of traffic. The above table refers to those only which are used for the public traffic, excepting that of Formosa. There are, in addition, a good many private telegraph and telephone lines worked exclusively for railway and for various other industrial purposes which, according to the latest report, amount to the remarkable figures shown below:

	Miles of wire.	Number of instruments.
Telegraph	10,892	1,340
Telephone	10,635	5,381

The first telegraph line in this country was constructed by some English engineers and linemen in the service of the Japanese government. The chief engineer was Mr. E. Gilbert, who had been connected with a railway company in Scotland before he came to Japan, and as may be imagined, the method of surveying, construction and maintenance of the land lines laid out by him was naturally after the English practice, and is continued, with more or less changes, down to the present day. The lines are built in a solid manner, so that they can withstand the attacks of storms, which are almost certain to come once or twice in autumn every year.

As to the telephone lines in towns, the method of construction may be said to follow American rather than English practice, and in some places where no cables are employed, as many as 100 to 150 wires are run upon a pole planted along the side of the streets. In large towns, however, these crowded overhead wires are generally being taken down and laid underground, and as will be seen from the table I give later on, there are at present some miles of underground lines.

Poles are generally of cedar, which grows in abundant quantity in different parts of the country. The number of main poles used varies, of course, with the number of wires

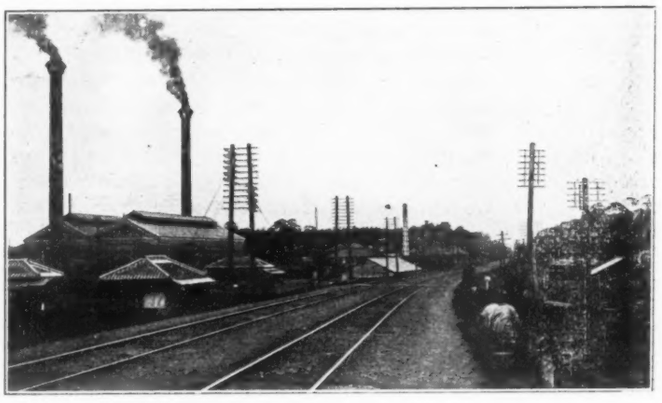


FIG. 1.—TELEGRAPH LINE.

put up, the nature of the route through which the lines pass, etc.; but in the open country there are, as a rule, from 38 to 26 per mile; and where there are too many wires for one pole to carry, trussed poles—often H poles—are employed. Ordinary main poles are of 22 to 24 feet. Taking the average, 64 per cent of the main poles are stayed, while 14 per cent are strutted. Boucherizing is a common prac-

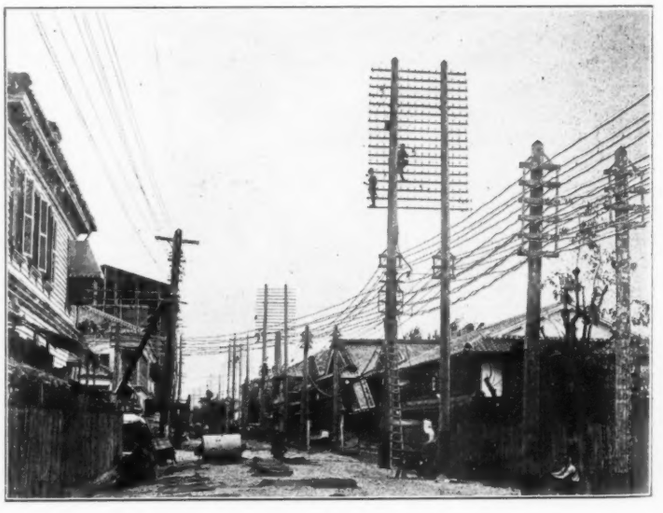


FIG. 2.—TELEPHONE LINE.

tice as a means of preservation of the poles, but lately creosoting is being tried though on a small scale.

Boucherized poles last about 18 years on an average, whilst untreated poles begin to decay within five or six years; and owing to the fact that the price of timber, which was fabulously cheap in the earlier days of telegraphy, has become somewhat expensive with the recent progress of engineering work in general, various compounds and meth-

Paper read at the International Electrical Congress at St. Louis.

ods of preserving wood have naturally had the attention of the engineers concerned. Considering, however, the different conditions of this country, the most suitable one for telegraph and telephone purposes seems, so far, to be the boucherizing process. Forty-six per cent of the poles are boucherized, the remainder untreated.

Arms with double-cup porcelain insulators are exclusively

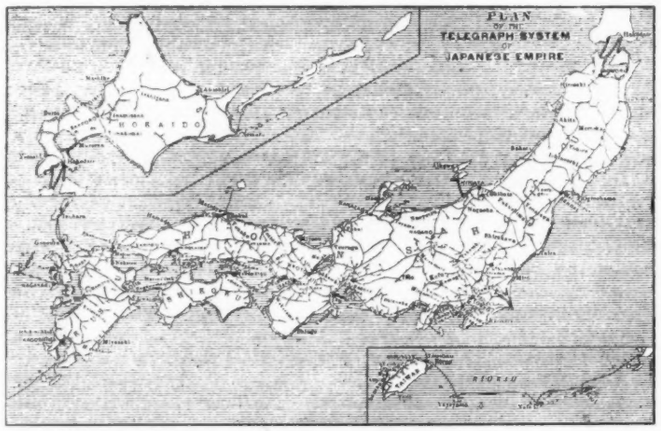


FIG. 3.

used and are always fixed on that side of the pole facing the so-called up-station. For telegraph lines, two-wire arms of 24″ and 34″ are generally used except where many wires are to be run. They are secured to the poles a foot apart, and alternately in case more than two wires have to be put up.

Telephone wires are run on four, six, or eight-wire arms most commonly, and long-distance lines on braced six-wire arms. The distance between the centers of the arms is one foot six inches, the minimum distance allowed from the ground to the lowest arm being 16 feet. The span of the long-distance lines is usually 48 yards, the minimum transportation being done at every twentieth pole.

No. 8 S. W. G. iron wire is the standard for the telegraph lines, though No. 11 iron wire is sometimes used for short lines. The long circuits for fast automatic or quadruplex working are of No. 12 S. W. G. copper wire. As a rule, an earth wire is attached to each pole.

For telephone lines in towns where there is not much snow we use No. 17 S. W. G. hard drawn copper wire, and silicon bronze wires, but in the northern districts where snowfall is abundant during the winter, No. 14 iron wire is run for subscriber's line. For the interurban telephone service three gauges of copper wires—No. 8 S. W. G., No. 12 S. W. G. and No. 14 S. W. G.—are employed.

For long spans such as river crossings, steel is almost always used in the case of telegraph lines, and bimetallic wire for telephone circuits of long distance. We had many long spans when railways were few, but at present we have our telegraph lines at river crossings, attached to railway bridges, or cables are laid on the girders in a trough. The longest air span now in existence is 800 yards with steel wire, and 320 yards with bimetallic wires, each of 170 lbs. per mile. Figs. 1 and 2 are respectively a general view of a telegraph line, and a telephone line in a town.

Underground construction for the telegraph lines is rather limited at present, it being confined to a part of Tokyo only; but the increase of telegraph wires from year to year, in addition to those for telephony, electric light and power, etc.,

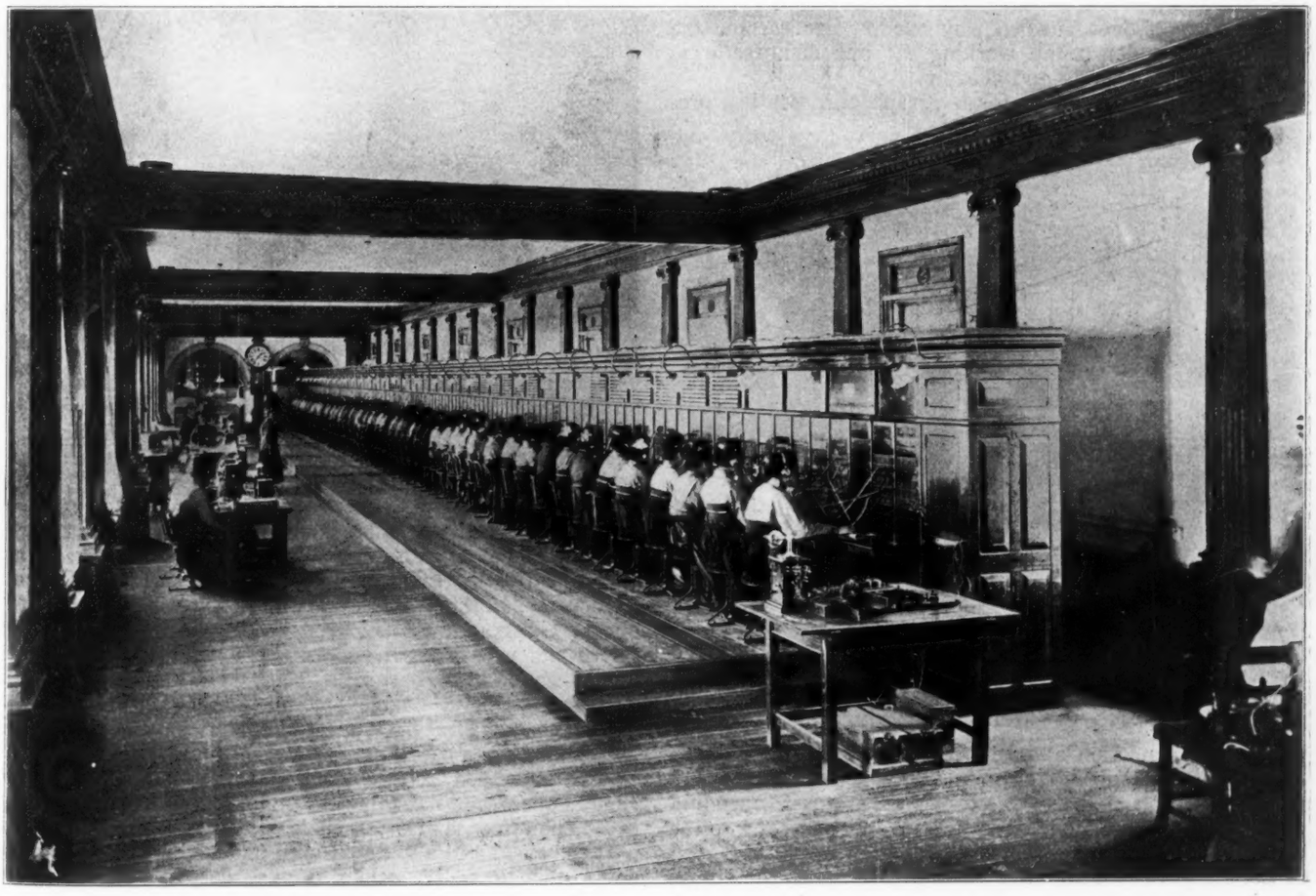


FIG. 4.—INTERIOR OF TOKYO EXCHANGE.

shows the necessity of laying more wires underground in the large towns, and it is very likely that in the course of a few years the telegraph lines in the busy part of the large towns will be put underground. The greater part of the telephone lines, however, in large cities such as Tokyo, Osaka, Kyoto, Yokohama, etc., is already laid underground.

When the first underground construction was undertaken in Tokyo in 1896, we adopted 3-inch cast-iron pipes and the same system was employed, to a considerable extent, in the

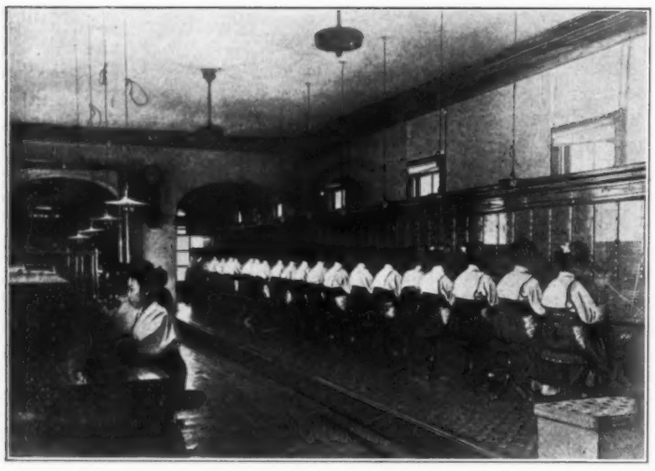


FIG. 5.—INTERIOR OF KYOTO EXCHANGE.

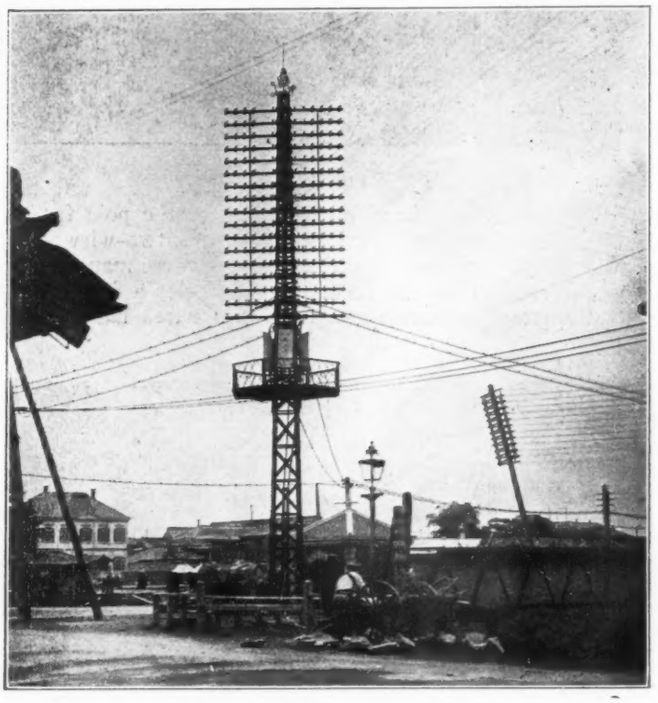
other towns also; but my visit to the United States in 1898 gave me a favorable impression as to vitrified clay conduit, and immediately after my return home, I advised the authorities to adopt it where we have more than three ducts. Since then the single-duct vitrified clay conduit has become the standard of underground working, as our manufacturers can make it excellently and cheaply.

Underground cable used for telegraph purposes has pre-

FIG. 6.—STREET CALL BOX.

pared fiber insulation and is covered with lead pipe. The telephone cable for underground work is of the dry-core paper insulation, and in large towns apparatus for sending compressed dry air from three to four atmospheres into the cable are provided for. This proves very useful in Japan as the cables are all imported, and in case cables should get low in insulation we can easily repair them. One hundred-pair cable was used when the underground work was commenced, but now, 200-pair cable is very common, No. 20 S. W. G. being the size of the conductors. Smaller wire cable has been suggested for some uses, but it has not yet come into actual use. Most of the lines in towns being overhead, we have naturally a great many aërial cables, both of India rubber and dry-core type, put up on poles to avoid too many telephone wires crowded together, or to cross electric light and power conductors, which are also carried along the streets like the telegraph and the telephone lines.

The laying of submarine cable was considered the most difficult work, and except in a narrow strait or in a river the work was almost always executed by the Great Northern Telegraph Company's steamer. The features of the country, however, called for a number of submarine cables in various parts, and in order to establish new communications and to maintain efficient working, it became necessary to do the work with our own staff. Sometimes we equipped a steamer



AN EXAMPLE OF OPEN WIRE CONSTRUCTION.

with rough machinery to lay a new cable or to repair a broken one, and although not without inconveniences in most cases, still we accomplished our object and in this way our engineers and workmen have obtained some useful experience in this branch of telegraph engineering.

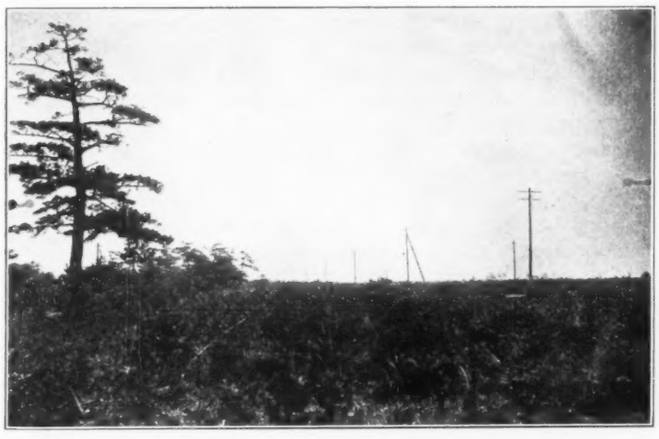
When Formosa was annexed to Japan in 1895 it became an urgent necessity to put the new possession in direct communication with Japan, and consequently measures were at once taken to lay cables connecting the Islands of Kiushu, Liuchu and Formosa. A cable steamer was built and fitted out at Glasgow for the purpose of laying and repairing cables and was brought out to Japan in June, 1896. The "Okinawa Maru," our cable ship, is a twin-screw steel steamer, having a double bottom. The gross tonnage is 2,212, the length between perpendiculars being 290 feet, the breadth extreme 40 feet, and the depth of hold 24 feet. She is equipped with triple-expansion engines, double-ended boilers, and has three cable tanks of 15,952 cubic feet, 8,389 cubic feet, and 6,945 cubic feet capacity, respectively.

It remained still a question with us whether our engineers could manage to lay cables in very deep waters, as their experience had previously been limited to comparatively

shallow waters, and it was strongly suggested to engage some experienced foreign engineers for the work. We wanted, however, to gain all possible experience and so we took up the work ourselves. The cables were successfully laid though not without some difficulties; they have been working well during the past eight years, being worked duplex with direct siphon recorders.

As mentioned elsewhere, Bréguet instruments were the first instruments used for the transmission of public messages, while Wheatstone needle instruments were used for the railway service. The complication of the mechanism of the former and the consequent liability to get out of order made its extensive use unsuitable, and very soon the Morse inkwriter replaced it.

Of about 1,100 telegraph circuits now working, 850 are fitted up with Morse instruments and the remaining 250 circuits are fitted with telephones. Out of 850 circuits, 90 are worked duplex, 9 quadruplex, 4 automatic, and the remainder simplex. The sounders were first introduced in Japan in 1895, and have been working in comparatively large offices only. At present about 40 per cent of the total instruments are sounders. Duplex telegraphy was tried in 1879 but its practical success dates from 1889; as to quadruplex working, it was only from 1893 that we could put it into actual



RURAL POLE LINE.

use on important circuits. The Wheatstone's automatic is limited to a few circuits in ordinary circumstances; but violent storms occur among the islands, particularly in autumn, and often cause an extensive breakdown of the important lines; on such occasions the automatic working is found valuable to dispose of the accumulation of messages. Repeater boards are employed in important centers to the best advantage of working. Telegraph exchanges are confined to circuits in towns or to very short and less important lines only.

The Morse signals used in telegrams written in the Japanese characters are 50 in number in addition to those representing figures, and the signs of punctuation, etc. These signals are partly composed of those representing the Morse alphabet, and partly of additional combinations of dots and dashes.

Telegraphically speaking, about 3.65 Japanese letters are equivalent to one word in English, which, on an average, consists of 4.67 Morse letters, and therefore one Japanese Morse signal corresponds to 1.28 international Morse signal. It may be, perhaps, interesting here to note how Japan is related telegraphically to foreign countries. Of the whole number of foreign messages forwarded or received, and which amount to some 800,000 a year at present, about 40 per cent are credited to Korea, 28 per cent to China, 9 per cent to England, 7 per cent to the United States, 4 per cent to India, 3 per cent to Germany, 2 per cent to France, 2 per cent to Russia and 4 per cent to all other countries.

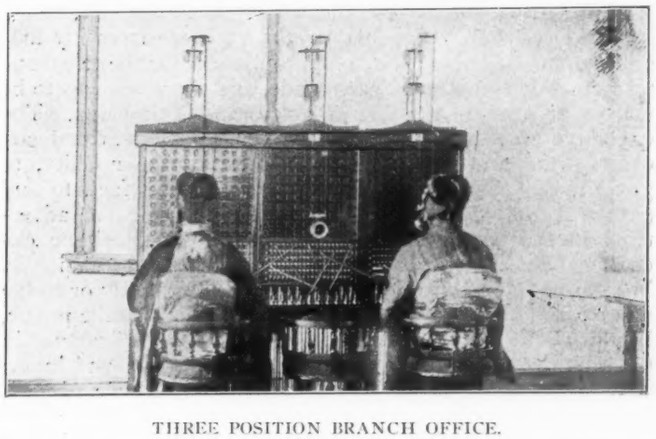
Testing lines is carried out in 24 different offices located in the important centers of the country. Conductivity and insulation resistances of the lines are regularly measured once a month, while the condition of the lines is ascertained every day by observing the current strengths received from the distant stations.

The lines are all worked open circuit with Daniell cells,

GOVERNMENT TELEGRAPH OFFICE.

except in Tokyo and Osaka, where storage batteries have been in use since year before last. The change from primary batteries to secondary in these two large offices brought about a considerable reduction in the expense of maintaining batteries therein, and changes in the other large stations are now being planned.

The charge for inland telegrams in Japanese letters is 20 sen (1 sen = ½ U. S. cent) per message of fifteen letters or less of text, the address of the receiver being free in this case; and for every five letters or less exceeding the first fifteen the additional charge is five sen. Inland messages in Roman letters are charged 25 sen per message of five words or less, the additional charge being five sen per word. For telegrams within the limits of a town, 10 sen per mes-



THREE POSITION BRANCH OFFICE.

sage in Japanese and 15 sen per message in Roman letters are charged: for additional letters or words exceeding the numbers allowed for one message three sen are charged per five letters or one word.

Fig. 3 is a chart of the telegraph system of the empire in 1904.

The telephone was first brought to Japan in 1877 by a mechanic returning home from America, and was a magneto telephone encased in a box. Soon after its introduction, the

telephone was put into practical use as an auxiliary to the police service in Osaka and vicinity, a considerable length of lines being built for that purpose. Some of the circuits then constructed were more than 30 miles in length and as many as ten such magneto instruments were connected in series on a single circuit of iron wire. As can be readily understood, conversation was no easy task unless by those who had experience in using the instrument. After the introduction of the carbon microphone the application of the telephone for industrial and commercial purposes began to increase remarkably, and it was in 1883 that the idea of starting telephone exchanges first occurred to the authorities. A company was promoted for carrying on the business and a petition was forwarded to the government asking for a license to start an exchange and carry on the telephone business in Tokyo. That was in 1884. The question whether it should be carried out as a government undertaking or entrusted to private capital remained unsettled

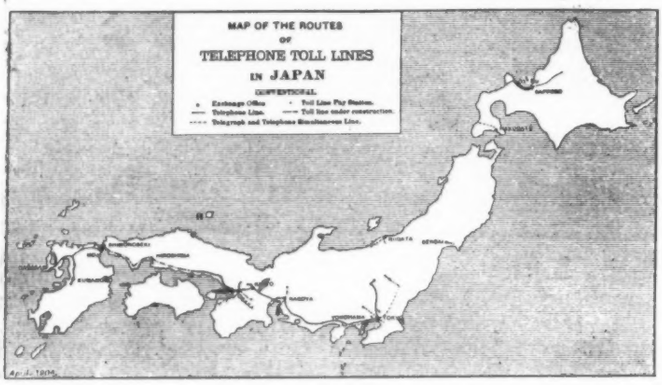


FIG. 7.

until 1889, when it was decided, after deliberation, to undertake the work as a state monopoly.

While the matter was still in consideration by the administration, it was thought necessary that our engineers should get more detailed information for the successful working of telephone exchanges. The writer was appointed to make a tour to Europe and America to study telephone matters. My stay in Europe and America lasted a year and a half, and it was in December, 1889, that I returned home from my first trip abroad. At that time an appropriation for the telephone undertaking had already been made, and the work was to be started as soon as possible in Tokyo and Yokohama. The executive office was opened in Tokyo, and letters and circulars were sent out to business men, to the nobility, to government officials, to manufacturers and, in fact, to any person in the city of more or less prominence. We advertised in the popular papers the opening of telephone exchanges and invited subscriptions from the general public. We did not confine ourselves to letters and circulars or to the newspapers alone, in introducing the telephone to the public, but, in addition, we put up a switchboard and telephones in the building of the Tokyo chamber of commerce, and in the rice and in the stock exchanges, and invited people of various occupations to try the instruments in order to be convinced of the practical utility of the telephone. In Yokohama the writer gave a popular lecture to convey to the public an idea of the commercial and social uses of the telephone. In fact, we spared no pains to secure a satisfactory result in the new enterprise, but notwithstanding such efforts on our part, we got only about 70 contracts in Tokyo and 20 in Yokohama when we commenced the construction of the lines. The service was started in Tokyo and Yokohama in December of 1890, the number of subscribers at that time being about 200 in Tokyo and 40 in Yokohama. However, the actual opening of the exchanges and establishment of communication between the subscribers spoke far more eloquently to the public than any letters, newspapers or lectures, and before long our facilities were far behind the demand. The growth of the telephone exchange business since 1890 may be seen from the following table:

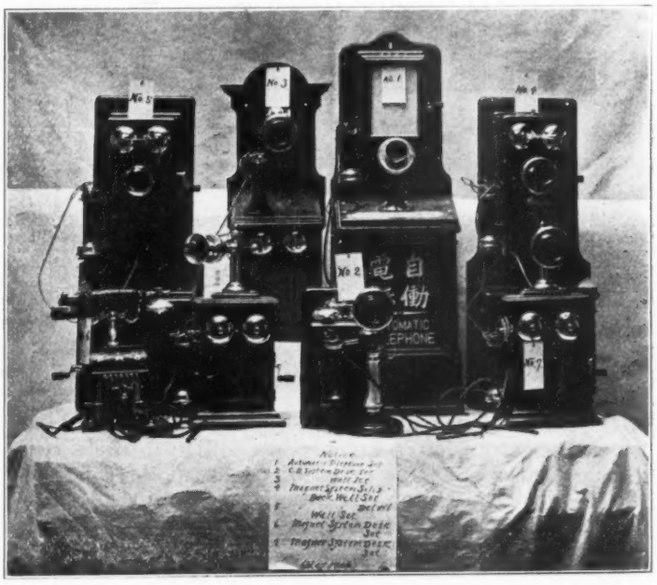
GROWTH OF TELEPHONE SERVICE.

Year	Number of telephone exchanges	Number of telephone substations	Miles of subscribers' lines (pole)	Miles of wires	Miles of overhead cables	Miles of underground cables	Nautical miles of submarine cables	Miles of toll lines	Miles of toll wires
1890....	2	359	100	669	.....	.....	.....	22	139
1895....	4	2,913	388	4,826	1	.....	.....	46	410
1900....	25	19,203	1.332	29,287	117	78	4	598	5,309
1903....	46	36,700	1.669	40,593	198	173	4	901	7,571

The increase of traffic necessitated putting up more toll circuits, and some 100 miles of new line with about 1,600 miles more wire are now under construction. On completion of the line, Tokyo and Nagasaki, which cities are 800 miles apart, will probably be put in direct communication.

When the exchanges were started in Tokyo and Yokohama, single circuits of No. 18 S. W. G. hard-drawn copper wire were arranged for subscribers' lines, the 100-wire standard switchboards of the Western Electric type and a modified form of the Gower-Bell telephone set with a battery for calling, were employed, the toll lines between the two towns being metallic circuits of No. 12 S. W. G. copper wires. No. 18 copper wires were afterward changed to No. 17, which is now the standard size of wire for subscribers' lines, except in the northern snowy districts; and the modified Gower-Bell set with calling battery, has been changed to the solid back or Delville set with a magneto.

Small exchanges not having upward of 600 subscribers are operated with the 100-wire standard switchboard, and for exchanges where more than 600 subscribers are to be connected, multiple switchboards are generally used. At pres-



TYPES OF SUBSTATION EQUIPMENT.

ent Tokyo has five exchanges, the largest of which contains 4,000 subscribers and the smallest 1,500, and each exchange is equipped with bridging multiple switchboards. In Osaka there are two exchanges, both of which are also fitted with bridging magneto multiples, having an ultimate capacity of 6,300. Reverse trunking is used between different exchanges in a town and also on short toll lines. Yokohama,

Kobe and Nagasaki are also worked with bridging magneto multiples, these towns having only one exchange in each. Kyoto, our ancient capital, was worked with the old series-multiple switchboards, but an alteration to the relay switchboards, manufactured by the Western Electric Company, was effected in May last year, and since then the system is working satisfactorily. Kyoto has no branch exchanges; it has an ultimate capacity of 6,300 and the present equipment 3,000. The series-multiple switchboards are still in use at Nagoya. All other exchanges are being operated with the 100-wire standard switchboards, but some of them experience inconvenience at times in working, due to increase of subscribers, and we anticipate supplying them with multiple switchboards. Fig. 4 shows the interior of the exchange in Tokyo, and Fig. 5 the interior of the Kyoto exchange.

In order to give an idea of the present situation of our telephone exchanges, I give the following figures for the seven towns where the exchanges are worked with multiple switchboards:

MULTIPLE SWITCHBOARD EXCHANGES.

Name of town	Number of subscribers	Number of subscribers not yet connected	Public call offices		Population
			Ordinary	Automatic	
Tokyo	14,192	8,019	46	68	1,640,000
Osaka	6,481	3,608	28	10	930,000
Kyoto	2,413	3,303	13	9	380,000
Yokohama	1,464	517	22	14	300,000
Kobe	1,437	1,152	16	9	280,000
Nagoya	1,327	1,023	7	6	270,000
Nagasaki	742	359	4	1	140,000

A subscriber's set is furnished with either the solid-back or the Delville transmitter and always equipped with an arrester. A desk set, artistically designed, is liked by some people and supplied, if required, upon an extra payment of 6 yen per annum. Where the C. B. system is employed, the same type as the postoffice wall set is in use, the transmitter being the solid back. Fuller's bichromate battery for the solid back, and the Leclanché for the Delville are generally used.

The automatic telephone, which has come into use since 1899 is somewhat like the Grey instrument, and so constructed that the operator is enabled to distinguish the kinds of coin put into the slot by hearing different sounds made by the coin in its sliding down along each chute. Fig. 6 shows a view of an automatic call box in the street of Tokyo.

No party lines are in existence at present, except a few telephone call office circuits in small villages. This system, however, has been often considered, with a view to meeting the pressing demand of the public for the telephone, but so far it has not come into use.

The actual number of toll line circuits amounts to about 100. In addition to that number 22 telephone circuits are formed by utilizing the telegraph lines for simultaneous transmission, and 20 by duplex telephony or virtual circuit. Simultaneous transmission of telegraph and telephone was first experimented in 1884 after the Van Rysselberghe system between Tokyo and Yokohama, but the experiment was not made with sufficient care and it ended in failure. The second experiment was conducted rather more carefully in 1886 by using the telegraph wires crossed and it resulted in a success.

When the telephone exchanges were started in Tokyo and Yokohama in 1890, all the lines connecting the two towns were specially constructed with copper wire transposed at intervals as a precaution against disturbance from external causes, and there did not exist much necessity to have recourse to the telegraph lines. In 1894 duplex telephone circuits were tried between Osaka and Kobe, which are 23 miles apart, and were worked quite successfully. In order to actuate the indicators on the duplex circuit, the neutral points of the repeating coils were earthed, and by using the circuit so formed by earthing, direct signal current was sent so as not to cause disturbance to the conversation. The telephone lines between Tokyo and Osaka were opened to the public use in 1896. Combining these lines, which are 377 miles in length, duplex telephony was successfully applied.

In course of time telephone exchanges were gradually opened in various provincial towns, which has enhanced the popularity of the telephone to a great extent and petitions for telephone facilities came in to the hands of the authorities from various quarters. This brought up the necessity of opening telephone call offices first in those places which did not possess telephones, and to save money, existing telegraph lines were used. At present some 1,000 miles of telegraph wires are worked simultaneously for the telephone. Fig. 7 shows the toll line system in Japan at the present moment.

The flat rate system is adopted in all towns. The charges are as follows:

Tokyo and Osaka.....66 yen per annum
Yokohama, Kobe, Kyoto, and Nagoya.....54 yen per annum
Other smaller towns.....48 yen per annum

These are for subscribers located within the town limits. Those living in the vicinity beyond the town limits, but within a certain telephone area specified by the government, can be connected to the exchange by a payment of 10 yen per 120 yards or under, for construction of a line beyond the city limits; and a payment of two yen per annum per 120 yards or under beyond the city limits as additional subscription.

Interurban lines are charged for according to the distance and for a conversation not exceeding five minutes. The basis of the toll rate is approximately as follows:

Up to 5 ri (one ri is nearly 2.5 miles)..... 20 sen
Up to 25 ri..... 25 sen
For each ri beyond 25 ri..... 1 sen

In a small provincial town or in a village specified by the government, and which is connected by a toll line to any other town having an exchange, people can be connected at their own expense to the postoffice of the specified town or village in order to make use of the toll line from their house.

Small switchboards are provided and worked in such postoffices by the government, and the subscribers have to pay to the government 24 yen per annum for the service as well as for expenses for the maintenance of the line, the instrument, etc., which by the agreement must be entrusted to the government. Seventeen such special exchanges are now working.

The financial condition of the telephone undertaking is a satisfactory one as shown by the following table:

TELEPHONE FINANCIAL STATISTICS.

Year	Expenditures in yen	Receipts in yen	Capital in yen
1895	91,548	142,616	.....
1900	964,899	1,533,417	.....
1903	1,230,592	2,670,631	12,618,658

The work is partly suspended for the present, owing to outbreak of the war, but when the peace is restored and commercial activity is resumed, it will, no doubt, be continued to meet the public requirements.

Lines of railroad in Colorado are being equipped with telegraphones, which enable a conversation to be carried on over a telegraph wire without interfering with the sending of a telegraph message over the same wire at the same time. Instruments are placed in cabooses and coaches so that in case of wrecks, communication can be established with headquarters immediately by throwing a hook over a wire and grounding the other end of the wire to the rail or car wheel.

The Telephone in Foreign Countries

USES TELEPHONES IN FIGHTING FIRE.

The fire brigade of Manchester, England, has recently been fitted out with a novel improvement in fire apparatus, which consists of a steam fire engine with certain interesting additions intended to facilitate the work of the firemen and to maintain communication between them and the officers in charge. The novelty consists in the provision of helmets for the firemen fitted with telephones and an air draught arrangement, and also in an electric lighting circuit supplying current to protected incandescent lamps which the men carry.

By the side of the steam cylinder is a single-barrel air pump, driven by a coupling and gear from the crankshaft, and also arranged so that it can be thrown out of action when desired. The air pump supplies four valves fixed on the side frame, quick hitching couplings being fitted to these valves for hose connections to the smoke helmets.

Over the fore-carriage is placed a dynamo to supply eight 32 c. p. incandescent lamps. This machine is driven by a belt from the flywheel of the engine, and is provided with a voltmeter and six reels. The latter hold 200 feet each of flexible insulated cable, and are fitted to supply the lamps. A large cage is fitted in the center of the machine for carrying six sixty-foot lengths of flexible metal air hose in coils. In front, under the driver's footboard, is a box to hold batteries for the telephone service and also the smoke helmets.

Each helmet is of leather with a mask extending over the shoulders, the front under the peak being left open, resembling somewhat in appearance the helmet worn by divers. The coupling for the air hose is at the back, and the draught is distributed around the wearer's head in front, so as to keep the eyes and nose clear of smoke. Inside the mask are the telephone receiver and transmitter, wires being led through the air valves, from whence wires are carried to a switchboard, so as to enable the officer in charge to communicate with his men working in darkness or smoke at a distance.

TELEPHONE RUSE UNCOVERS BIG THEFT.

Because of a telephone message received from heaven, Nicanor Vergara, the watchman of a big cotton mill in the eastern part of the city, confessed that he and other employes of the factory had been stealing for several months and thus he solved a problem that had vexed the manager of the factory for the last three weeks, says the Mexico City *Herald*.

Pablo Rivero, the manager of the factory, found that large quantities of cloth disappeared from time to time, and estimates that the property stolen amounts to about $14,000. Up to Saturday afternoon he had been unable to discover the robbers, but knowing that the watchman was stupid, decided to make him confess, if he did know anything, by means of a trick. The watchman was summoned to the manager's office. He was told that God had just spoken to the manager, saying that he and some other men were stealing valuable property. The watchman protested his innocence, and even swore that he did not know a word about it. Then he was told to put the receiver of a telephone to his ear. A clerk of Rivero, previously sent to another place, sent the following message:

"Thou shalt not steal, thou shalt not swear; thou hast broken these two of my commandments, and I am going to punish you. Unless you confess to Mr. Rivero, this very night I will send a bolt of lightning to kill you and——"

Vergara did not want to hear any more; he dropped the receiver and trembling from head to foot and crying like a baby fell on his knees before the manager of the factory and confessed. He had never seen a telephone, he had never heard of its existence, so he believed that God himself had spoken to him.

After Vergara's confession he and five other employes of the factory were sent to Belem. They all have admitted their guilt and have been declared "bien presos."

HYPNOTISM BY TELEPHONE.

Hypnotism by telephone is the latest scientific achievement, if report speaks truly. Under trial arrangements made recently in London, Ahrens Meyer, the cowboy hypnotist, recently carried out some startling experiments in this connection. His first subject, an elderly gentleman, grasped the receiver in his right hand, and applied it to his ear. "Hello!" he cried, in response to Meyer, and then, softly, "Yes,—yes, yes," each word fainter than the one before. His left hand clutched convulsively at his knee, and, within thirty seconds, he was in a complete hypnotic trance. It is devoutly to be hoped that young lady operators will not emulate the example of Ahrens Meyer, and study the gentle art of hypnotism by telephone; in their hands it would indeed be a powerful weapon. Imagine, for instance, the portly and choleric company director limply sinking into his chair after a stormy interview over a long-delayed trunk call; or the energetic and discourteous office boy, frozen into a torpor by a little judiciously applied hypnotic treatment on the part of the young lady at the exchange.

FAILURE OF PENNY-IN-THE-SLOT TELEPHONES.

"Penny-in-the-slot" telephones do not pay in Liverpool, and according to the Liverpool papers the system is to be abolished. No more instruments of this type will be issued. The system involves separate switchboards, additional staff and a differential administration for which in the Liverpool head office there is not space at command. Penny-in-the-slot subscribers have been charged a subscription of £3 10s. per annum, and there has been a condition that if the pennies placed in the instrument in the course of a year do not amount to 30s the subscriber is to make up the difference. This has involved a considerable amount of clerical work on the part of the telephone company's staff, and has caused some irritation on the part of subscribers. The National Telephone Company offers in place of the penny-in-the-slot a system known as the X and Y. Two separate subscribers may use the line in common at a charge of £6 per annum each. The disadvantage is that when one of them is using the wire it is blocked to the other; but each, if curiously disposed, can hear the conversation carried on by the other.

THE QUEEN'S TELEPHONIST.

A new office has been inaugurated at Windsor castle in connection with the household of Queen Alexandra. It is that of court telephonist, and the responsibility of the position may be conceived when it is borne in mind that the queen does not herself speak over the telephone or place her ear to the receiver, deputing that to the newly appointed court telephonist, who, accordingly becomes initiated into every secret and confidential matter that passes over the

wire between Her Majesty and her ministers and officials. The court telephonist, who will rank with Mr. Hiley, the court telegraphist, is a son of the late General Sir George Maude, known to so many American tourists in London as superintendent of the royal stables and crown equerry. Young Mr. Maude, who is a relative of Lord Montalt, has for some time past been attached in a secretarial capacity to the office of Sir Fleetwood Edwards, keeper of Her Majesty's privy purse.

WOMEN CLERKS IN GERMANY.

Women have become an indispensable factor in the German postal telegraph and telephone service, it seems, in spite of the conservatism which prevented the utilization of feminine activities in public work in Germany until nearly a half century later than in France and England. United States Consul Monoghan of Chemnitz, in his recent communication to the United States Department of Commerce and Labor, reviews briefly the conditions and requirements which are of interest as showing the progress of women in the Fatherland.

It is not every woman who can obtain a position in the German postal service, so strict are the governmental regulations respecting age, character, education and health. A government medical examiner pronounces upon the health, which must be perfect; the age must not exceed thirty or be under eighteen, and a good common school education is a primary requisite. Possessing all these qualifications, the woman candidate is eligible only to a position as assistant in a postoffice, and the highest salary she can hope for is $119 a year. In the telegraph and in the telephone service, however, all grades of positions are open to women. Though the rules of admission are equally strict, and no women with children are employed.

Four thousand women are now engaged in the telephone service of the German Empire. It is stated 1,000 of them are in Berlin. The hours are light, ranging from six to eight a day. The highest pay which a woman can draw in German telephone offices is $357, which is said to afford a comfortable living in Germany, but is a low wage compared to that to be obtained in England, where experienced women telephone clerks get $600 and chief supervisors are paid as high as $2,250. In Germany, however, it must be noted that women on their withdrawal from active labor after the prescribed number of years of faithful work, are awarded a government pension on the same plane with the men.

THE PARIS TELEPHONE SERVICE.

The second number of the bulletin of the Paris Association of Telephone Subscribers has been issued, a large part of which is given up to the recital by subscribers of their struggles with the administration to get a good service. There is much wailing over bells that do not ring, operators that do not operate, inspectors that do not inspect, and superintendents who write explanations that do not explain. An article of some interest gives a detailed account of the proposed addition to the telephone staff in Paris, for which the Chamber of Deputies is asked to vote a yearly sum of 242,675 francs, for 270 new operators. It would appear that the staff must have been allowed to run rather behind the work if 270 operators are needed at once. The total number of subscribers in the Paris system is not stated, but the number of operators' positions at the different exchanges is given in detail, the total being 650. At an average of 60 lines per position this would mean about 39,000 subscribers' lines. For the regular work of the subscribers' boards 1,300 operators are required, and for the long-distance boards 208. In order to allow for sick leave, etc., 10 per cent more operators are required, and for supervision and monitor work 312 supervisors and monitors. This gives a total of 1,971 trained operators. As the operators have to be trained before they can be put at the switchboards, a certain proportion of operators are always under instruction. This adds another 150 to the staff, and to cope with the normal increase of subscribers 50 new operators are needed each year. This brings the total number of operators required at present to 2,171. Total number of interurban circuits in France is 5,291, there having been an increase of 1,817 circuits during the year 1903. The total number of telephone subscribers in France, outside of Paris, is 54,509, there having been an increase for the year of 9,500.

In an article by one of the legal members of the association a detailed review is made of some of the government regulations affecting the telephone service. The legal authority finds fault with many of the regulations, and condemns them as arbitrary and unpractical. He finds fault in particular with one rule, which lays down that in all towns of over 80,000 inhabitants the telephone service shall be supplied only at flat rates. The reviewer very justly remarks that this bars out the small user and prevents many people from using the telephone service at all.

GIRLS AS TELEPHONE SERVANTS.

A Rome dispatch says: The London correspondent of the Secolo sends a most interesting letter to that paper on his trials with the long distance telephone, he having a London-Paris-Milan wire in his rooms.

After much experience he has come to the conclusion that women may make admirable public clerks in every other walk of life, but that as telephone servants they are a decided failure. He gives as a reason that a woman unseen comes to be scarcely a woman, so that perhaps they are not addressed always with courtesy, and on the other hand the girls take no interest in their interlocutor, as he is invisible. He finds the London telephone girls slow and indifferent, the French intractable and impertinent. When the Whitaker Wright trial was proceeding he found himself late with some news and rushed to the telephone. Absolute silence followed his frantic ringing, until he almost pulled the telephone from the wall. After twenty minutes or so a sweet voice said, "Number please?" "But," he protested, "I have been ringing for half an hour!" "Oh, really! I am so sorry, I was drinking my tea!" In Paris the girls are absent-minded and usually make the connections badly, but have invariably an excuse and will not hear remonstrances. Once the poor victim could not make himself heard, and the telephone girl said pertly, "Mais c'est votre instrument qui ne marche pas!"

The Italian telephone girl, by the side of her London and Paris sisters, shines indeed. She is obliged to repeat the number wanted and seldom makes a wrong connection; she is prompt, and not exceptionally pert, but she is lazy and will often tell you that the person you want does not reply when she has made no effort to ring him up.

The question is, Would men do any better?

TELEPHONE CABLES INJURED BY INSECTS.

The Sino-Japonaise Telephone Company, of Shanghai, has made an interesting discovery. Some years ago the aerial telephone cables of this company gave a great deal of trouble due to puncturing of the lead sheathing. It was thought at first that the damage was done by mischievous boys, and a reward was offered, in an endeavor to detect the culprits, but without result. A further study of the difficulty then revealed the fact that the holes in the lead, which were small and round, were made by an insect which usually lived upon bamboo. These insects develop in July and August, and finally lay eggs in the openings which they make in the lead cover. No trouble was experienced on those lines which did not pass near bamboo thickets. A simple and effective remedy for the trouble was to wrap the cables with burlap soaked in boiled linseed oil, instead of

lead. Since this has been done no trouble has been experienced.

TELEPHONE VS. TELEGRAPH IN EUROPE.

In Europe the telephone is fast distancing the telegraph in point of growth and popularity. Recent statistics show that the increase of the former is much more than that of the latter, an effect which is possibly due to the tremendous increase in the use of the telephone. In Denmark fewer telegrams are sent now than ten years ago, although telephone conversations have increased over five times in as many years. In Sweden the revenue from telegrams shows but little increase, while the increase in the use of the telephone was, during one year, 10 per cent. In Norway the same conditions obtain. In Germany there has been practically no increase in the number of telegrams, while the number of telephone messages increased 65,000,000 during the year 1902. In Hungary the increase in telegrams during the year 1902 was about 5 per cent.

TELEPHONE NOTES FROM ABROAD.

The use of telephone apparatus is spreading every day in Monterey, Mexico. On an average, ten instruments are installed every week.

It is reported that $65,000 will be expended in the installation of an up-to-date telephone system in the city of Pretoria, Transvaal, South Africa.

The Spanish government is about to establish telephone plants in the following towns in Spain: Berga, Gironella, Pulgrieg, Balsareny, Salient, Castelladrae, Cardona.

Business men of Port Arthur, Ontario, propose to build a telephone line from that city to Duluth, Minnesota, taking in all the towns along the north shore. The distance is 196 miles.

The Italian government has set aside a sum, amounting to 1,300,000 lire, to be devoted to the installation of telephone lines making use of the Pupin system, between Naples, Rome and Turin.

The Canadian Machine Telephone Company, which is installing a telephone system at Peterboro, is seeking a franchise to install an automatic municipal telephone system in Brantford, Ontario.

Advices from Guatemala City are to the effect that the Guatemalan government is considering the advisability of making a considerable extension of its present telephone and telegraph system. The indications are that it will do so.

An effort is being made to get the Canadian government to take over the telephone system of that country. A special committee made up of F. C. Bruce, Samuel Barker and W. A. Robinson has been appointed to consider and report on the question.

By the formation of a short circuit in one of the junction-boxes in an electric main in Melbourne, Australia, every city fire brigade received an alarm. Every telephone bell in the vicinity was rung, whilst 1,500 indicator-shutters dropped in the exchange.

The municipal telephone system in Great Britain seems to be serving very satisfactorily. At present exchanges are either operating or in course of construction in Glasgow, Portsmouth, Brighton, Swansea and Hull. With the exception of the London postoffice system, the Glasgow plant is the largest underground service in England.

The Board of Control of Toronto, Ontario, has drafted an agreement for a new telephone franchise for the Canadian Telegraph and Telephone Company. Two thousand telephones must be installed within 21 months. The franchise is for seven years and has provisions for renewal for five-year periods, with the right of the city to expropriate.

A government telephone line is now being built from North Bay to the Temagami district, in Ontario, along the line of the new government railway. Train orders are given by telephone, and telephones are installed at the various gravel pits along the line. A government telephone line is also being built from New Liskeard to Haileybury.

The Mexico City *Herald* says: "The new device whereby the young women of central telephone exchanges will be prevented from flirting is a cruel and barbarous evolution of modern progress. Will the senoritas of the Mexican exchanges be debarred from this innocent diversion—only had recourse to when business over the wires is dull and slack?"

A Parisienne has formed a company for placing in all public cabs a book which will contain telephone numbers and society addresses, and also those of the principal stores. Thus people riding in cabs, particularly women, will have at their finger tips a very convenient volume. Its title is "Paris en Voiture" (Paris in a Cab), and it will contain more than 700 pages.

In connection with the new telephone system of the Bengal Telephone Company, Ltd., a telephone cable of the latest type has been laid under the river at the Howrah Bridge The new system is to be practically an underground system, which will then render the telephone wires free from all atmospheric disturbances. The existing cables between Calcutta and Howrah are to be replaced.

According to the London *Daily Mail,* Professor Quirino Majoruna, a young electrical engineer, has succeeded in sending spoken messages up to a distance of several miles by means of a wireless electric apparatus, the sound being conducted along waves of light. In the course of twelve months he hopes to have an absolutely perfected apparatus. His invention is now on view at the St. Louis Exposition.

The telephone is being used with advantage in the campaign against the Yaqui Indians in the state of Sonora, Mexico. In the Bactete mountains, where the majority of the rebellious Indians are in hiding, a telephone system has been completed and is now in operation. Twenty-four military stations are connected by this telephone system, and the quick communication afforded between various points is proving disastrous to the Yaquis.

Considerable activity has been shown during the present year in the development of the telegraph and telephone in Russia. One million nine hundred thousand rubles were appropriated for the construction of new lines, about one-fourth of which has been devoted to telephone and the remainder to telegraph construction. Seven hundred million rubles were expended in establishing telegraphic communication along the Trans-Siberian railroad.

A representative of a telephone manufacturing company in Chicago has been in Windsor, Ontario, looking for a Canadian site for a factory. He says that a factory for the manufacture of all kinds of telephone supplies will be erected there within a short time, and that the company will employ 150 hands at the outset. The factory will be run in connection with the Ontario Independent Telephone Company, which is bidding for franchises in Canadian cities and towns.

Since the decision of the Brantford, Ontario, city council to install a municipal telephone plant, the Stark Telephone, Light and Power System, Limited, of Toronto, has sent in a revised offer, which has led to the council rescinding the by-law for municipal ownership. The Stark company in its offer agrees not to sell to or amalgamate with the Bell Telephone Company or its successors. This company has about completed installation of a system at Toronto Junc-

tion. This is said to be the first public system using an automatic system to operate in Canada.

Direct telephone communication between Vancouver and the various cities along the Pacific coast is declared to be a certainty. Arrangements are practically completed for the installation, by the New Westminster and Burrard Inlet Telephone Company of Canada and the International Telephone Company of Bellingham, Washington, of a telephone cable line to connect on a direct wire, Bellingham and Vancouver.

In the British house of commons recently, Lord Stanley informed Sir T. Dewar, M. P., that, since April, 1902, orders amounting to about £109,000 had been issued for the equipment of telephone exchanges in London, most of which were given to a foreign firm which held numerous patents for the central battery system. Circumstances are gradually altering, he said, and it was hoped that before long it would be possible to obtain telephones for the use of subscribers from British makers only.

With the help of the telephonic apparatus employed by the Electric Ore-Finding Company of London a discovery of what is believed to be a large bed of hematite ore has been made in the Furness district, on the royalty worked by the Barrow Steel Company. A shaft is about to be sunk to the veins of iron ore which have been thus located, and, in the meantime, experiments are being conducted in other parts of the company's royalty. This is the first occasion on which the ore-finder has been employed to locate the presence of hematite ore underground.

A Norwegian has invented a queer way of finding out where the fish are. A microphone, which is an instrument that will catch and transmit the least little bit of sound, is lowered into the water from a fishing smack, and a wire from it leads to a telephone aboard the boat. Now, as the herring, codfish and mackerel schools number thousands and tens of thousands of fish, their passage through the water naturally causes a rushing sound, which can be heard by the fishermen at the telephone, and thus they are enabled to lower their nets at the right time and in the right place.

A movement is on foot in New Brunswick to secure the amalgamation of the Central Telephone Company and the Union Telephone Company. The Union company has its head offices at Florenceville, with lines extending to Woodstock, Andover and Grand Falls. The Central Telephone Company has its head offices at Belleisle. This company is gradually absorbing the smaller Independent lines and expects soon to have its lines running into St. John City. Those interested in the companies feel there is plenty of business for others besides the New Brunswick Telephone Company and they will cater to a class of business that the New Brunswick Telephone Company does not reach.

Detroit capitalists have organized another telephone company and with an authorized capital of $100,000 have obtained a charter to do business in the province of Ontario. They are empowered to carry on the general business of a telephone company, with various restrictions as to the erection of poles and wires which guard the rights of private and municipal property. The incorporators are: C. W. Taylor, capitalist; R. Brooks, real estate agent; J. A. McRae, grocer; P. T. Chestey, contractor; A. D. Prosser, attorney, all of the city of Detroit. The company proposes to begin its Ontario operations in the county of Essex.

The telephone system in Panama is operated and owned by Ernesto Lefevre, under a concession that has still four years to run. The population of the town is in the neighborhood of 18,000. Of these 60 per cent are too poor to afford a telephone. At present there are about 75 subscribers, the rates being $4 silver per month (exchange at rate of 110 per cent for sterling). Colon, the town on the other side of the Isthmus, has a population of about 4,000. Communication, by means of the telephone between the two cities, is controlled by the railroad company. The average cost of telephone poles is about $10 silver, and the duty on telephone material 20 per cent *ad valorem*.

The membrane of a telephone, whose vibrations are what physicians call "forced"—this is, they are maintained by the speaking voice, and the disk is not left to itself to vibrate freely—takes only about a thousandth of a second to get into full swing. This has been ascertained by Dr. R. Kempf-Hartmann, a recent German investigator, who studied the motion of the membrane by reflecting a spot of light from a mirror, attached to it, so that the light would leave its record on a moving photographic film. From such records he obtained a set of curves for vowels, diphthongs and consonants, and also for other sounds. The membrane takes only two swings to attain its full movement, and after that the curve is steady.

Charmed by the voice of Mlle. Marguerite Young, a pretty telephone girl of Paris, a subscriber sought her acquaintance. His wife overheard a subsequent conversation and set a watch, which resulted in a suit for divorce, in which Mlle. Young was named as corespondent. The telephone management suspended the girl without waiting for a decision in the case. This aroused the ire of the judge, who declared that the telephone manager had no authority over the private lives of employes. The judge declined to grant the divorce, saying that a decision which would operate against the girl would mean loss of her employment and possibly force her upon the street, which was too grave a punishment for a girlish peccadillo.

Herbert Laws Webb of London spent several weeks recently in visiting the new common battery telephone systems of Budapest, Moscow, Warsaw and St. Petersburg, and found that the Budapest exchange was rebuilt last year and now occupies one of the finest telephone buildings in Europe. In the three great Russian cities the new systems which have been in course of construction for the past two years are just now beginning operations. In each case complete new plants have been provided, comprising the most modern devices in switchboard equipment and extensive systems of underground service. Mr. Webb also visited Christiania, Stockholm and Vienna, and everywhere found telephonic development making steady progress.

COON INVADES TELEPHONE OFFICE.

There is a pet coon in this town that was the innocent cause of a thrilling adventure lately. The adventure took place in the telephone office one night about a week ago. Two of the "hello" girls were at the board. They were the only persons in the building. Becoming thirsty they went into the hall where the ice water tank is located to get a drink. The coon meanwhile had left its customary resting place and started in search of new haunts. Seeing the light in the telephone office and being prompted by some unkind fate, it climbed upon the porch and entered the office through the open windows just as the operators were quenching their thirst in the hall. They started back into the room, when they noticed the wiggly form of the intruder. The door was closed with a bang and a scream and they took refuge in the long-distance room. Not being able to get out or in they grabbed the long-distance line to Junction City. They informed the operator there that a wild beast was in the telephone office and asked that Junction City telephone the Union Pacific operator to come to the rescue. This was done and shortly after four or five men armed with every imaginable weapon from a gun to a broom made a charge on the office and captured the pet without firing a shot.—Abilene (Kan.) *Chronicle*.

Theory of Telephone Exchange Development

G. DE LA TOUANNE

THE question of telephone rates is one of widespread interest, but, although daily discussed, it is generally little understood by the public and sometimes even not by telephone managers. When looking at a large railway station and its extensive switching system, anyone understands that every track is a source of complication; but strange to say, as to the telephone, everything seems simple and cheap, because the subscriber's instrument is simple and easy to handle. It is just as if we considered the railroad industry easy, simple and cheap, because we have only to sit down in a car. The fault does not lie, perhaps, entirely with the public; the current opinion would possibly be less erroneous if the public were allowed more freely to learn what is behind the walls of a telephone office and what is the organization of the big telephone exchanges. Even the fact that to satisfy the call of one subscriber for any other of only 10,000 subscribers, involves provision for about 50,000,000 circuit combinations, does not make clear to the public the amount of capital, skill and inexhaustible care necessitated.

Thus, in spite of efforts to develop a better understanding of telephone affairs, it may not be useless to call to mind from time to time some of the conditions to which the telephone industry is subject. The following is an attempt to summarize the principal commercial questions met in starting a new telephone exchange. This attempt is necessarily academic, for I assume my city to be virgin ground, telephonically, and I leave competition out of account. These conditions are hardly to be found in practice, but it may not be without interest for others to compare with the theory here developed the data derived from experience, and I hope that some members of the section may be induced to make statistical contributions of actual results.

For illustration, let us consider a simple case, a single-office exchange to be started in a city of 50,000 inhabitants, one subscriber's instrument on each line. The income must cover expenses and provide a dividend. The outlay depends

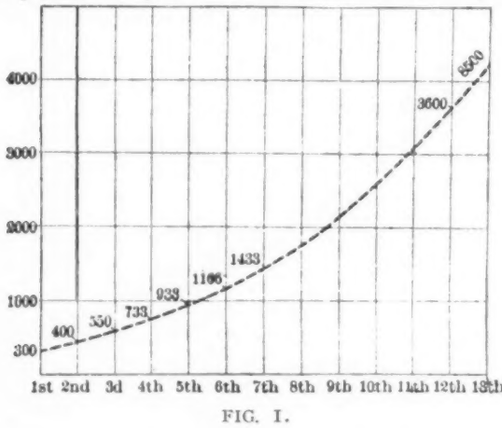


FIG. I.

FIG. I.—MEAN YEARLY NUMBER OF SUBSCRIBERS.

on the prospects of development. The first question is, therefore, what are these? It is exceedingly difficult to answer, even from what is known of old exchanges; the demand is quite different to-day from what it was in the early days. For want of precise data, we may reckon on 6 subscribers per 100 of population in, say 12 years, and perhaps 12 in 20 years; the 6 per cent in 12 years seem very probable, and in 20 years the telephone will likely be more common than gas is to-day. Taking as the rate of increase of population in the city only the general rate of increase, 20 per cent of the United States between the two censuses of 1890 and 1900, the present city of 50,000 inhabitants will have a population exceeding 60,000 in 12 years, and 72,000 in 20 years; that is for the exchange 3,600 and nearly 8,500 subscribers, respectively. Therefore, we may plot the curve Fig. 1 of the mean yearly number n of subscribers supposed to be provided for.

The charges on the enterprise correspond first to the total capital invested; second, to the annual expense of working the exchange. Two portions are to be made of the total capital T, one, P for permanent investment, another, F, as a portion of the floating capital necessary for the payment of the working expenses.

$$T = P + F.$$

PERMANENT INVESTMENT, P.

The part P is devoted to four classes of expenses, lines, land, building and apparatus (subscribers' instruments and central office apparatus), each presenting very distinct features.

LINES.

The line plant includes the wires and the distributing system of these wires.

As to the distribution of the circuits, there is no doubt that, the exchange being devised for several thousand subscribers, the distribution will be almost entirely underground; nowhere, probably, shall we again see a new Stockholm telephone tower, however remarkable a piece of work it may be. Both the interest of the public in the street and the interest of the enterprise will forbid frequent underground construction or reconstruction. We want, therefore, sewers with cable racks or some form of conduit, but both of ample capacity. The former system is probably the ideal one, but much too costly for an exchange of the size considered, unless the sewer system exists and is available for the purpose, as in Paris. We turn, therefore, to conduits; and as a properly built conduit lasts for years, there is no risk, and our policy will be to plan at once a system of conduits substantial and flexible, and devised for the full number of subscribers contemplated, 8,500.

But for spare plant, it would be sufficient to have 43 ducts, one per cable, for as many 200-pair cables, divided at the office into three or four routes, then, further away, into routes of 10 and 8 ducts, and less for 100 and 50-pair cables. But spare plant is one of the most difficult things to foresee. In the conduits you are bound to have spare ducts, first, because you cannot determine the ultimate number of lines in every direction; you can only approximate; second, because spare ducts facilitate repairs; third, because the addition of a few ducts at the start costs very little, but becomes very expensive later on. The best practice allows an average of 40 per cent spare ducts.

Outside the conduit system, the lines must be completed in different ways—inside house wiring, short sections of cable, pole lines, etc. An estimate of the probable average length l and of the probable average price p' per unit length (reserves included) will give the probable average price lp' of this complement of the subscriber's line, while the principal part will be the cables drawn into the general system of conduits; the lines in the outlying districts are often disproportionately expensive; it is necessary to allow for this in estimating the average cost per subscriber.

As to lines in general ducts, the cost is that of the metallic circuit in the cable, laying and spares included. The lowest

Paper read at the International Electrical Congress at St. Louis.

average preparation of spares is about 40 per cent; this means that, in the calculations, the average length l' of underground circuit for a connected subscriber must be taken as 40 per cent greater than it really is.

If there are rights of way to be paid for in any form—cash, free telephones, etc., this is a charge on capital, to the extent to which it involves immediate outlay; for a free telephone it will be the price of the user's instrument, line, jack, etc., and a proper proportion of land and building.

LAND, BUILDING, APPARATUS.

Apparatus comprises subscribers' instruments and central office equipment.

Calling the cost of a subscriber's set t, the total cost of the subscribers' instrument is nt.

Location and building must suit the type of switchboard adopted; storerooms, repair shops and offices can be leased almost anywhere; the switchboard with its accessories affords the only reason for buying land and erecting a building. The question of the switchboard must, therefore, be examined before the two others.

At the beginning we shall use standard switchboards (cost b) for three reasons: First, they are cheap; second, untrained operators and inspectors cannot be charged with the handling of a multiple, with a complicated power plant and other accessories; third, up to, say, 600 answering jacks, there is little or no gain to the service in the multiple switchboard. But, of course, the land must be bought from quite other data and in view of the remote future, or what is considered a remote future in telephony, say 20 years; that is the space should provide a single floor for a multiple switchboard, to accommodate the ultimate number of subscribers, estimated at 8,500; if we put the average subscriber's connections per year ultimately at 3,000, or 10 per working-day, this will give 85,000 connections a day, which, with two-thirds of the traffic in five hours means a load of 11,333 connections per hour; at 200 per operator and per hour these 11,333 require 56.66 operators during the busy hours, let us say 57, able to reach the total number of jacks; this they will do with 19 sections, equipped with 450 answering jacks each; the 19 sections, with two end-sections, will have in a straight line (or in horseshoe shape) a length of about 129 feet. In dealing with the working capacity of the switchboard, we shall do better to abandon the old expression "subscribers per operator," and talk of "connections per operator's hour." "How many subscribers do the operators attend to?" is a question of idle curiosity, if not completed by another one as to the average number of connections per subscriber during the busy hours. "How many connections per operator and per hour, or more briefly, per operator hour, do you admit?" has a definite and practical meaning

Coming back to the switchboard-room, we need a surface of about 3,700 sq. ft. to be doubled, if possible, for the cloakroom, the tearoom, etc. In round numbers the area of the land to buy will be 8,000 sq. ft. Such a purchase is almost free of risk, especially if not all built on, for the price L of the land is not likely to fall, and will probably rise; during the first years one floor will answer all the requirements of the service; if there is no existing building a light structure, one-story high, will suit all purposes, and the saving in building will partly make up for the price of the land, leaving the latter as good security for a loan, if necessary. The cost of this first construction, equipment included (protection against fire, heating apparatus, service telephones, furniture, lighting appliances, etc.), will be quite moderate. Some years later, when the enterprise is a success, a more substantial building (cost E) will be erected. Some may consider that the adoption of a single office is wrong, that it is better to have branch offices, and that, therefore, the above provisions for the head office are too costly.

The problem of sub-offices versus a single office is too important to be treated here, and we are leaving it out of consideration; we are studying simply the equipment of this single office. Taking the mean number of subscribers during the first year at 300, and for the second year at 400, we shall have four 100 line standards at once, another one the next year which will provide spare jacks for a time, and yet another one at the beginning of the third year. As the mean number of subscribers during this third year is assumed to be 550 (Fig. 1) we should have a margin of only about 100 at the beginning of the year, quite inadequate, unless, at the same time, we order a multiple switchboard to be furnished in about six months. As to this, to reduce the annoyance from frequent extensions in the switchroom when extensions are needed, we shall endeavor to make them for at least two years at a time. Even if it were not for the small size of the first multiple, we should, in consequence, order it for at least the mean number of subscribers in the fifth year, 933 from Fig. 1. In five years the traffic will be a known quantity, but to figure the probable cost B of the multiple switchboard, we must assume something; we can suppose that the average annual number of connections for these 933 first subscribers has reached its ultimate figure, say 3,000, which corresponds to a traffic of 9,330 connections per working-day, two-thirds of which concentrated on five hours at 1,244 per hour is not full work for seven operators.

This shows, first, that it will be amply sufficient to get three sections with one end-section, three operators' positions for the section, 150 answering jacks per position; second, that seven operators, or even six, during the busy hours will easily handle the work, facilities being afforded for calling in two or three extra operators either to relieve the others or for learning the service during the busy hours; third, that the multiple must be provided with electrically worked signals (self-restoring drops or lamps), thus permitting three operators only being used most of the day, without being worried to replace signals in position; fourth, that, if proper precautions are taken at the beginning, the mounting of the multiple will be easy.

WORKING CAPITAL, F.

Working capital is a necessity, and it must be liberally provided for. For some time, and before the earning power of the exchange has become substantial, the only source from which it can be derived is the capital invested: a part F of the total capital T will constitute the working capital.

As a resumé we have $T = P + F$ where

$P=p+$	$nlp'+$	$nl'p''$	$+nt+$	$\begin{cases} b \\ B \end{cases}+$	L	$+\begin{cases} e \\ E \end{cases}$
Permanent investment. Conduit.	Complements of subscribers' lines.	Subscribers' circuits in general conduits.	Subscribers' instruments.	Switchboard.	Land.	Building.

ANNUAL EXPENSES, A.

These include:

Working Expenses ..	W	Sinking Fund	S
Maintenance	M	Contingencies	C
Depreciation	D	Reserves and Dividends .	R

WORKING EXPENSES, W.

Under this head may be grouped:

Fire and Accident Insurance.	Taxes.
Rights of Way and Royalties.	Management.
Operating Force.	Labor.

As to taxes and insurance there is little to be said. Rights of way and royalties paid under one name or another include

a certain proportion of annual expenses; for instance, on the free telephone hypothesis, the user's service (maintenance of instruments, lines and switchboards, operators' pay, etc.) is a charge which must be taken into account.

As to expenses of management, or generally speaking as to staff, for a few subscribers the staff may be proportionately very small; but when the system grows and becomes more complicated, it is otherwise; you want numerous statistics, accurate records for every part of the business, strictly kept accounts of the various kinds of expenses and earnings, a high grade of maintenance of the plant; that is, you want a numerous and skilled staff, without which you will lose money, and dissatisfy the subscribers by an inefficient service. Telephony is purely an industry of the age. The product to be delivered, a quick service with good commercial transmission, is to be delivered in large quantity; it is a wholesale industry; like a big manufacturing or commercial house it can make money; or, it may fail completely, if the whole machine is not kept in perfect order and if every detail is not constantly watched. From actual needs, the proportion in big exchanges has gradually risen to one employe to every 12 subscribers; the manager must bear this in mind to prevent any further necessity of raising the rates; when fixing rates at the start, he is bound to consider the inevitable expenses of the future and not the low ones of the present.

MAINTENANCE, M.

Maintenance includes materials and salaries.

The money provided for salaries is part of the above working expenses and is not considered here.

The cost of materials M can be divided into: Materials for general conduits; cost p_1.

Materials for completing the subscribers' lines outside of the conduits; cost $np l'_1$.

Materials for the portion of circuits in the conduits; cost $nl' p''_1$.

Materials for the subscribers' instruments; cost nt_1.

Materials for switchboard and accessories; cost $\begin{cases} b \\ B_1 \end{cases}$

Maintenance $\begin{cases} e_1 \\ E_1 \end{cases}$ for the building will be added, but done as it is for the most part on contract, there will be no distinction between materials and labor.

The conduit being of substantial contruction will not cost much; maintenance may be put at 3 per cent of the initial cost. As a more delicate piece of apparatus and submitted to hard work, the switchboard will cost more for maintenance, probably between 5 and 10 per cent.

$$M = p_1 + nlp'_1 + nl' p''_1 + nt_1 + \begin{cases} b_1 \\ B_1 \end{cases} + o + \begin{cases} e_1 \\ E_1 \end{cases}.$$

DEPRECIATION, D.

Depreciation differs widely for the different parts of the system.

For the reason just given, the conduit depreciation will be small and 5 per cent is probably more than enough, but as we have no sufficient data as to the life of the modern conduits, we may retain this percentage.

The same percentage, 5 per cent, seems reasonable for cables in conduits.

The aerial subscribers' lines, which are of less durable construction, we put at 20 per cent, and the subscribers' instruments, which are often roughly handled, at 33 per cent

The first building may have to be replaced in eight or ten years; we shall take 12.50 per cent depreciation. The second building, being assumed to be of first-class construction, 5 per cent seems proper.

Switchboards of the standard type are assumed not to be used after the end of the third year, because of the growth of the exchange; there will be probably an opportunity to use them again in the future; but we shall not rely upon this and shall, therefore, count 33 per cent depreciation on the price of the six standards, in spite of the very short service of the sixth.

For the multiple switchboard, we could, on the basis of the manufacture of to-day, count 10 years' use; but it is hard to say that any system can be considered as fulfilling all requirements more than six or eight years, owing to rapid changes in type; we think to-day that we are pretty nearly perfect; the same has been supposed in the past and has always proved erroneous by the remarkable improvements of the switchboard. Therefore, if our aim is to give the best service obtainable (and that is the only way to make the telephone popular), we are bound to consider changing our switchboards even when in good working order; from the commercial point of view alone there may be strong reasons for the prompt adoption of a new and more efficient system; putting the maximum certain life of the switchboard at eight years corresponds to a depreciation of 12.50 per cent. If later improvements do not necessitate changing the switchboard, it will be used two years more, thus saving so much for other purposes.

$$D = 0.05p + 0.20nlp' + 0.05nl' p'' + 0.33nt + \begin{cases} 0.33b \\ 0.125B \end{cases} + \begin{cases} 0.125e \\ 0.125E \end{cases}.$$

SINKING FUND AND INTEREST, S.

It will be perhaps difficult to avoid some borrowing; we shall assume that this is the case for a fraction mT of the total capital T and we have, therefore, to provide for a special sinking fund; we shall hasten, of course, the redemption of this debt as much as possible, in 10 years at the most; at 4 per cent interest for 10 years, the annuity to be allowed is $0.1233mT$.

For the redemption of the capital $(1-m)\ T$ we shall figure $0.05\ (1-m)\ T$ corresponding to redemption in 20 years.

$$S = 0.1233mT + 0.05\ (1-m)T.$$

CONTINGENCIES, C.

Whatever expenses we may have provided for, there are always contingencies, gas explosions in manholes, flooding of the conduits, breaking down of fixtures or poles, accidents, etc. For such contingencies we shall add at least 10 per cent to the above general expenses.

$$C = 0.10\ (M + D + W).$$

RESERVES AND DIVIDENDS, R.

The gross earnings must allow a certain sum to be put aside for further extensions or improvements. Considering the development of telephony, 10 per cent of the total capital will not be too much to face the corresponding expenses.

Finally will come the dividends. Very little is to be expected in that respect for the first two or three years; later on a dividend of 7 per cent, when possible, will be only fair; but an increase of this dividend is not to be advocated even if the profits increase, until the reserves equal the capital, in one form or another.

As to annual charges, we allow 17 per cent on the capital as a minimum to cover reserves and dividends, whenever circumstances permit, I mean when the rates calculated on that assumption remain within reasonable limits.

$$R = 0.17T \text{ (minimum)}.$$

INCOME.

The revenue is derived entirely from the rates paid by the subscribers (flat rate or measured service). The average sum to be paid per subscriber (or per conversation) is the quotient of the division of the annual charges A into the number of subscribers n' (or number of conversations, i. e., number of subscribers $\times$ average number of conversations). The number of subscribers n' to be now considered is lower than the number n used in the calculation of the expenses. We are not sure to get the subscribers for whom we have provided; and as the expenses are for the largest part not proportional to the number of actual subscribers, it would

be unsafe to fix the rates from the numbers *n*. For instance, the three great elements of cost are the underground plant, land and building; it is obvious that you cannot wait until you have 8,500 subscribers to be repaid for your outlay. The ideal would be to adopt what the well-known economist, Mr. Cheysson, has called the "Tarif avantageux." If you sell any desirable product for nothing, you will sell much of it and get no return; if you sell at a prohibitive price, you could have a profit if there were any selling, but as there is none, the return is again naught. Between these two extremes the curve of total return (number of pieces sold × profit per piece) reaches a maximum and the corresponding price is the most advantageous, the one giving the maximum profit. This we could determine if it were possible to get from the public true answers to a circular stating the different rates which could be accorded by the exchange on different numbers of subscribers and asking them to state the highest rate at which they agree to subscribe. For a time the exchange would stand by this "advantageous tariff;" later on, when the financial situation is stronger (loan repaid or reserves laid by for plant renewals), the rates will be reduced and a new "advantageous tariff" applied, benefiting both the enterprise and the public; if the subscribers knew that with a certain growth their own rates would be reduced, they would become soliciting agents. But this is impracticable, and the manager must base his rates on other considerations. He might plot the probable charges for a certain number of years and not only for the two or three first ones, and thus get a better idea of a scheme of rates to apply progressively and methodically, but only a knowledge of the local conditions will allow him to start on a proper basis.

Two general remarks may be added.

As has been noted above, conduit construction and land purchase are two heavy burdens on the enterprise. Therefore, if for some reason the cost of conduit is practically eliminated or considerably reduced, as by the use of a system of sewers or by the payment of a small rent for municipal or private subways, the telephone enterprise will be able to reduce rates very appreciably. Similarly a reduction will be possible if the concession is a long one and if only a small sinking fund rate is applied to the land, being justified by the nature of the property.

The next most important feature is the discipline, care and close co-operation of the whole staff. Since in many cases maintenance is a third or more of the gross earnings, it is needless to say that not only must the best construction be done at the start, but also that the greatest care is called for in the use of the plant and in its up-keep. As to the operating force, the necessity of discpline is still more striking. Discipline can increase the efficiency of this force as one to three or four. In this connection some may think 200 connections per operator hour too high, but in reality this should be taken as a minimum; it is a mere question of training. I remember in the Paris system of the old times with an average of two trunkings for each connection, a certain operator who could usually make 120 connections per hour; her work represented something like 400 connections an hour with a modern switchboard in a single office exchange. And about 1890, the operators at Nashville, Tenn., series multiple switchboard, with testing as distinct from connecting plugs, actually made 300 connections per hour and thought they could make 30 in five minutes (rate: 360 per hour) on a spurt. These same operators could doubtless handle 400 connections per hour with the improved switchboards of to-day (say one-fourth to one-third less, if the connections are trunked). This was due to discipline. The operators knew what they had to do and not to do, never talked with a subscriber, but connected him with the chief operator as soon as he began to say anything besides the number of the subscriber wanted, and so on. The force was well disciplined, so were the subscribers. The result was an efficient co-operation of both, giving the public the kind of service paid for.

If for any reason the management is afraid to give the operators more than say 1,500 connections a day to handle, this has nothing to do with the operating capacity of the switchboard nor with the number of connections per operator hour; that means simply a special distribution of the force through the day, three gangs of operators for instance, instead of two. The operator when at work must get all that can be got out of the switchboard, then go home; that is the place for rest, not the exchange. Let her work hard six hours or even five, and go; she will enjoy her rest and work more cheerfully. Hard work, good rest, is a sound rule everywhere.

CONCERTS BY TELEPHONE.

The distribution of music in identically the same manner that electricity is now delivered into private houses is the object of the Pacific Coast Telharmonic Company, which has been organized in Seattle. The company claims to have the exclusive control west of the Rocky Mountains of a device which will generate and distribute music by electricity through the medium of an ordinary telephone circuit. By means of this invention, it is claimed, a single central station at San Francisco could, if thought desirable, distribute music to nearly 600,000 people; one at Los Angeles, about 300,000; one at Denver, nearly 500,000; one at Portland, 200,000; one at Seattle, 250,000; one at Spokane, 100,000, and so on.

The company proposes to use a device which is the product of the genius of Thaddeus Cahill, a resident of Holyoke, Mass. By the system it is planned to distribute from a central station to all parts of Seattle, or any other city in which the device is installed, concert programmes of the best music interpreted by skilled musicians. To turn on the music, the promoters of the company claim, is as simple as the act of flooding a room with electric light.

"The promoters of the enterprise have acquired the exclusive license to use this invention in all of the territory west of the Rocky Mountains, including ten states," T. O. Abbott, manager of the new company, is quoted as saying. "It is their expectation to organize local companies throughout the district mentioned and put the machine into practical operation at the earliest possible date. Seattle will be the head office of the parent company, and all of its business will be conducted from that city.

"On a common shaft are set a number of small alternating current armatures, each producing a current of a particular vibration—the frequency corresponding to the known vibration of a given note in the musical scale, whether the frequency is in a piano, violin or drum. The circuits of these constantly rotating armatures are carried to a keyboard, arranged much like that of a piano. When music is desired a musician, by lowering a key, closes the circuit of the corresponding dynamos onto the line, which carries the requisite vibration to the receivers at the house of the subscriber, and in this way the music may be produced simultaneously in thousands of houses, scattered over an area of many miles. A specially devised receiver will be connected with this line at the residence of each subscriber, and will be so arranged that it can be cut off or turned on at will, just as electric light is now used. In each such receiver the particular note, or combination of notes, for which the performer has connected the proper keys, will be repeated."

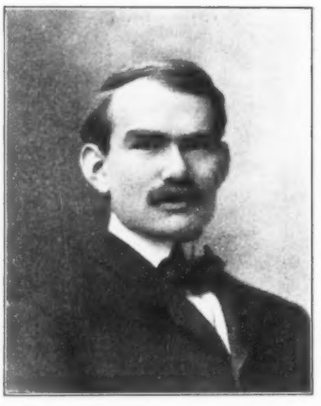
Prof. W. B. Patty of Chicago regards oceanic telephones as a sure thing. In a recent lecture he stated that he regarded the long distance telephone under seas as a probability of the not far distant future—an outgrowth of wireless telegraphy.

Electrolytic Receivers: Wireless Telegraphy

DR. LEE DE FOREST

IN THE preparation of this paper I have made use of one upon the same subject, which the writer recently read before the Franklin Institute, as well as of laboratory notes of Dr. J. E. Ives, and those of Mr. Greenleaf W. Pickard, collaborators in this research work.

The form and nature of the ordinary filings-tube coherer, as applied to-day in wireless telegraphy, is fairly familiar. Branley discovered, in 1891, that the effect of electrical oscillations upon a body of metallic fillings was to produce a marked increase in the conductivity of the mass, a conductivity which persisted until the particles were broken apart again by mechanical jar. Although Varley, Hughes, Onesti and others had previously noted this phenomenon, none of these investigators had fully appreciated the causes involved, or given to the world of science the benefit of their researches in thorough published reports.



DR. LEE DE FOREST.

The discovery of the "coherer," therefore, is rightfully attributed to M. Branley, but to Prof. Popoff, of St. Petersburg, and to Sir Oliver Lodge, of England, must be given the credit of applying the relay and mechanical tapper to the filings tube, the addition of antennal wings, of upright wire and earth connections, and the first steps toward refinement and an appreciation of the possibilities of the new detector as applied to an unborn branch of human enterprise and progress.

The notable work of Marconi in still further adapting the Popoff-Lodge arrangement to commercial requirements resulted in the gradual increase of distance on which aerographic communication was established. Ingenious improvement in coherers by Tissot, Ducretet, Castelli, Lodge and Branley, and in this country by Shoemaker, comprise the history of that form of detector.

Enormous is the bulk of research matter published regarding the coherer. Theories of the action involved have been numerous, but divided chiefly into two schools: First, that of Lodge, who demonstrated an actual welding together of metallic filings, after the same had been drawn into contract by the electrostatic attraction of the opposite charges induced upon the faces of the filings; and, second, that of Branley, who ascribed the action to a breaking down or puncturing by minute sparks of the dielectric film (either gaseous or a metallic oxide), which he held must exist between opposing surfaces of the filings.

The result of the years of investigation, which have followed the early work of these two pioneers, proves that in a measure both were right. The Branley effect undoubtedly exists and affords a satisfactory explanation of the self-decohering phenomena observed in the microphone type of auto-coherers. These insulating oxide or gaseous films inevitably form and cling to the surface of any metallic particles not inclosed in absolute vacuum, and where strictest care is not taken to prevent. They are, moreover, elastic, self-healing; and unless the electric impulses are of excessive violence, so that adjacent particles are actually welded firmly together, the original high resistance is automatically remarked, and necessitating a vigorous mechanical jar to

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stored upon cessation of the electric impulse. This is notably the case when the elements of the radio-conductor are of carbon, hardened steel, carbon-mercury, aluminum, etc., where the formation of this resisting film is easily accomplished, or where, amid the minute roughness of the carbon surface, the adhesion of a gaseous film is made more easy.

If, however, the coherer consist of some soft metal of relative low-fusing point—silver, gold, lead—the Lodge cohering effect through actual welding follows upon the Branley action, making the final fall of resistance far more [illegible] break up the cohered filings and restore sensitiveness.

The filings tube frequently shows a change from hundreds of thousands of ohms down to a few ohms under the influence of exceedingly weak electrical impulses. It is on account of this enormous change in conductivity of the filings tube coherer that this form has been the standard used almost exclusively in the coherer systems of wireless telegraphy.

The result of all this has been necessarily a system employing delicate relays, tapping-back adjuncts, complications of apparatus requiring frequent and careful adjustments, a skill and delicacy on part of the receiving operator seldom found outside of the physics laboratory—least of all on a man-of-war.

Again, despite numerous claims for speeds of word transmission by coherer systems, I have yet to see proof of anything exceeding twelve or fifteen words per minute, while the actual everyday speed attained seldom exceeds half that amount.

For commercial applications of wireless telegraphy this pathetic speed limitation of itself renders the filings-tube systems to-day an impossibility, regardless of any other considerations, such as uncertainty of their action, ill-adaptability to electrical tuning, liability to interference (notably from atmospheric electricity), harmful effects from mechanical vibrations, etc.

Better commercial results are obtained with the auto-coherer, or so-called microphonic contact. Since no tapping-back is required, a relay is superfluous, although the charges of resistance in the auto-coherer are generally so slight, and the normal resistance such a shifting quantity, that no relay capable of operating reliably with the auto-coherer has yet been perfected. A telephone is invariably used to-day in place of the relay and inker, and, inasmuch as the auto-coherer is usually a quantitative instrument possessed of no critical voltage, its combination with the telephone affords an extremely sensitive wave-detector.

With this arrangement one obtains a word reception limited only by the ability of the operators to send dots and dashes with the transmitter spark and to translate them into words. Consequently, in this country, we find the alternating current of relatively high frequency and excellent regularity of action employed; with an ordinary Morse key, obtaining a speed of twenty-five to thirty-five words per minute, instead of the antiquated induction coil with its sputtering, sticking hammer interrupter, or its messy, explosive mercury-break; and the pump handle "Zeichengeber," which is considered abroad as a fitting accompaniment to the co-

herer receiver, and is so well designed to hold down the impatient sender to a sloth sufficient for that form of receiver. As we occasionally have seen in the daily press, the spark-coil, coherer systems are excellently adapted to the trying requirements of a "chess game by wireless telegraphy."

The auto or microphonic coherer is, however, not well suited to the requirements of close syntony or electrical tuning. This is on account of its variable normal resistance and normal capacity. The device is liable to close up under the effects of severe static discharge, requiring readjustment by tapping, rendering difficult its employment during time of severe atmospheric disturbances and lightning storms. Moreover, its inability to reliably operate by a relay a bell for calling purposes often necessitates the addition of a filings tube for that purpose.

Following this brief review of the field of cohering indicators of electric waves, I will call attention to an entirely distinct line of research leading up to forms of receivers, which I believe may well be set in a class by themselves as regards sensitiveness, simplicity and general adaptability to most of the demands which can be made to-day in the field of wireless telegraphy.

In 1898 the German Neugschwender performed the following experiment: The silver plating of a strip of mirror-glass was divided into two parts by a sharp razor cut, leaving a narrow gap between two silver edges, completely insulating the two sections. Each of the sections was now connected to the terminals of a dry battery, and a telephone and galvanometer inserted in series in the circuit. No current was observed to pass until a film of moisture was deposited upon the slit, either by blowing the breath thereon, or by placing a saturated sponge nearby, or by placing a drop of water directly upon the slit. After a brief period the galvanometer began to show violent and irregular deflections; in the telephone a scratching, bubbling sound was heard, followed shortly by comparative quietness and a stable position of the galvanometer needle, indicating that the resistance of the gap in the silver mirror had been broken down until it measured but a few ohms.

If electric waves were now generated in the neighborhood, as from the spark of an induction coil, the galvanometer showed an increase of resistance in the circuit, while the listener in the telephone heard a humming sound, reproducing that of the induction-coil spark. Upon cessation of the electrical impulses the conductivity of the gap in the mirror instantly reasserted itself, and the sound in the telephone ceased.

Aschkinass, a year after Neugswender discovered this strange action of the Hertzian waves, noted the same phenomena, the publication of which led the former further to pursue his researches, and to examine the action at the moist edges of the silver electrode under a powerful miscroscope. His observations thereon, and my own investigations in 1899, coincide in all essentials, and demonstrate that the phenomenon is one of electrolysis due to the combined action of the Hertzian and local currents. They demonstrate, however, several features new to the generally accepted ideas of electrolytic action, and open up lines of speculation and research of unusual interest to the physicist.

The phenomena noted above exist to a more prominent degree with tinfoil electrode in place of silver, and these I shall now attempt to describe. With the telephone to the ear and the eye at the microscope the action, thus doubly observed, affords in fact one of the most fascinating, most beautiful pastimes (as I may well term it) ever granted to the investigator in these fields.

When the local e.m.f. is first applied to the gap, minutest metallic particles, all but invisible, even with a thousand-power lens, are seen torn off from the anode, under the stress of the electric forces, apparently mechanical in action; and these dust-like particles, floating in the fluid, move across to the cathode; some rapidly, some slowly, by strange and grotesque pathways, or directly to their goal. Tiny ferry-boats, each laden with its little electric charge, and unloading its invisible cargo at the opposite electrode, retrace their journeyings, or caught by a cohesive force, build up little bridges, trees with branches of quaint and crystalline patterns.

During this formative period (lasting perhaps for half a minute) the ear hears an irregular boiling sound, and the average deflection of the galvanometer indicates a gradual decrease of resistance, until one or more of these tin trees or tentacles has been built completely across the gap. Then silence ensues until the current across the bridge is suddenly increased, as by the Hertzian oscillation from an electric spark made in the neighborhood, or even from a source of so low frequency as the ordinary sixty cycles alternating current. Instantly all is commotion and change among the tentacles, and especially where these join the cathode. Tiny bubbles of hydrogen gas appear, and enlarging suddenly, break or burst apart the bridges, while the click in the telephone indicates the rupture of the currents' path.

Yet they are persevering—these little pontoon ferrymen—and instantly reform, locking hands and hastening from their sudden rout back to build new paths and chains. So the process continues, the local current re-establishing the electric oscillations, breaking up its highways of passage with furious bubblings and agitations—a veritable tempest in a microscopic teapot.

The hydrogen gas, having, of course, twice the volume of the oxygen, is most in evidence, and, therefore, the rupture of the tentacle occurs chiefly at its cathodic terminal, and where segregated branches of the tin trees are broken off the bubbles of gas are generally noticed at the cathode. The oxygen, to a large extent, enters into chemical combination with the tin, and after the slit has been used for some time a grayish deposit of stannous oxide may be scraped from the anode.

One fact must be borne in mind, that the fine tentacles (whose diameter, by the way, is of the order of some hundred thousandths of an inch) do not come into actual metallic contact with the anode terminal. A film of electrolyte of almost molecular thickness must exist between the two, conducting normally by electrolytic ionization and conduction, yet easily decomposed and transformed by a sudden increase of current into an insulating gaseous film, the expansion of which still further increases the resistance of the gap.

The nature of this electrolytic action when soft metals, such as tin, silver, lead, are used as anode, and when the distance to the cathode is decreased to the order of 1/100 in. or less, is rather surprising. The electromotive forces needed for electrode position from anode to cathode are extremely small, nowhere approaching the critical e.m.f. of polarization of the electrolyte.

Moreover, distilled water, so-called chemically pure glycerine, oils, etc., contain enough of impurities, such as acid traces, to enable them to act here like an electrolytic solution. I have in ten minutes plated a firm deposit of tin on a gold cathode, using distilled water only and a potential difference not exceeding 1/10 volt.

For the same reasons it is possible to decompose the water films interposed between branches of these tin trees by a very minute difference of potential between; meaning that this electrolytic responder does not necessarily posses a "critical potential," as is common to a coherer. It does not, therefore, cease to respond to electric impulses, the potential of which is less than the e.m.f. of polarization of the electrolytic, as commonly understood.

If now the electrodes be slowly separated from one another, with one or more of the minute tentacles clinging thereto, a counter e.m.f. of polarization may be observed

when the distance between the nearest electrodes exceeds a certain small limit. This counter e.m.f. exists whether the electrodes be of like or unlike material or shape.

Upon the first application of the local battery to the terminals of this cell, a temporary flow of current is observed, the resistance of the cell being at first slight, especially if a dilute alkali or acid form the electrolyte. Immediately thereafter, however, the current flow falls almost to nothing, and the counter e.m.f. of the cell asserts itself. This counter e.m.f. is due to the formation of a layer of gas insulating the faces of the electrodes. It means that unless some depolarizing means be added, the local applied e.m.f. must be raised above the opposing e.m.f. of the cell, or above the critical voltage required for the decomposition of the electrolyte.

Now when the cell is placed in the path of the high-frequency electrical oscillations, the effect is found to be a temporary, more or less complete, annulment of the counter e.m.f. of polarization. This effect is scarcely noticeable when the tentacles are made the cathode, but when made the anode so that oxygen is the gas surrounding and insulating the fine tentacles, the effect of the Hertzian oscillation is to decrease to a marked degree the apparent resistance of the cell.

The sensitiveness of the electrolytic cell to this action of the Hertzian oscillations is in a measure proportional to the exposed area of the anode. With such coarse anodes as are furnished by the point of a one-mil platinum wire, the action is extremely sensitive. I am using such in working from a St. Louis Exposition station to Springfield, Illinois, 105 miles overland; yet the diameter of these electrodes is 100 times that of the fine tentacles or trees previously described.

Last year a German experimenter, Schlœmilch, reported the discovery of this same effect in what he called "polarization cells." Anodes having diameters sufficiently small to give great sensitiveness to the responder may be obtained by mechanical means, using the Wollaston wire, having gold or platinum core and a silver sheath wherewith after drawing the whole to a fineness of 2 or 3 mils, the silver sheath is dissolved in concentrated acid, in a manner long known to the arts. The order of diameter thus obtained is comparable to that of the metallic trees built up by electrolytic

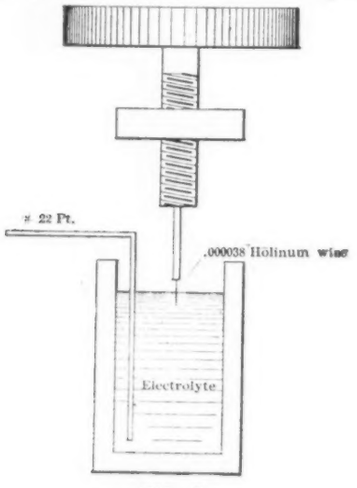


FIG. 1.

deposit; and the wire anodes are more stable and better suited to the work in this second type of the electrolytic responder.

Prof. Fessenden maintains that the phenomenon observed in this form of the electrolytic responder is a heat effect, and on that supposition chooses to style this form of receiver a "liquid barreter." His theory is that the Hertzian currents passing from the fine electrode into the electrolytic heat this latter, and, since the thermal coefficient of most electrolytes is negative, such heating would result in a decrease of resistance of the electrolyte. I have been unable, however, to find a single fact warranting such a view.

First of all, the fact that the device is a valve-effect, not indifferent to the direction of applied local potential, but practically inoperative if the tentaode be made negative, shows that the effects obtained are not chiefly I^2R effects, as would be required were the action a heat phenomenon due to the amount of current flowing. Second, that it is a potential-operated and not a current-operated device, possessing a capacity and normally insulating the fine anode. Third, that its action is sensibly unaffected by extremes of temperature, high or low.

Numerous experiments have been pursued with scrupulous care, all of which show that this heat theory is untenable. A few of these I will outline. In these experiments form of the electrolytic cell was employed having the dimensions and constructions shown in Fig. 1.

It was first necessary to determine quantatively the effect of the received oscillations upon the local circuit of the detector. Preliminary experiments had shown that the magnitude of this effect depended upon the voltage of the local battery as well as the strength of the received oscillations. It was, therefore, important to determine the resistance changes for a constant intensity of received oscillation with varying battery potentials. For this purpose the circuits shown in Fig. 2 were set up.

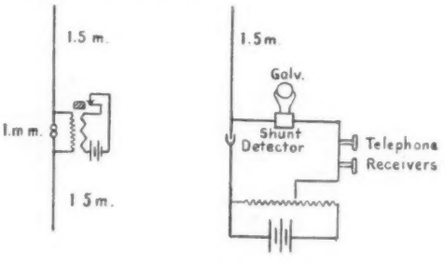


FIG. 2.

Galvanometer readings were taken every 0.2 volt between the limits 0 to 4.5 volts of the normal current flowing through the cell when no oscillations were being received, and the apparent resistance of the cell calculated from this by dividing the voltage of the local battery by the current value. This gave curve 1 of Fig. 3. Curve 2 was obtained in the same way, with the oscillator in operation.

These curves show several points of interest. It is apparent from the curves that the magnitude of the response, that is to say, the ratio of normal resistance to responding re-

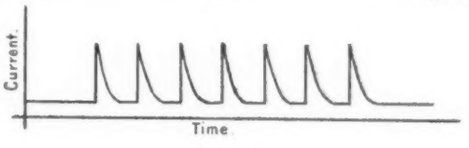


FIG. 3.

sistance, is greatest with low potentials. But the loudness of the sound in the telephone receivers is greater with the higher voltages. The reason for this is apparent when we consider that the intensity of sound in a telephone receiver is proportional to the square of the current variation, or in other words, a great variation of a feeble current does not give the sound that a slight variation of a relatively strong current produces. It so happens, however, that the human ear does not respond to sound in a linear ratio to its absolute intensity, so that the observed increase is more nearly linear than quadratic.

Inasmuch as the cell recovers its normal resistance very rapidly it must do this to a certain extent between oscillation groups, so that the curves really represent the integra-

tion of the alternating high and low-resistance states over the time of the complete signal. It is probable that the true minimum resistance is several times lower than that given in this curve. Assuming that the recovery of the high resistance is due to polarization of the small electrode, it is evident that if the electrode becomes in any way depolarized, and is then left to itself, repolarization would be very rapid. As the immersed area of the anode is of the order of a millionth of a square inch, the amount of separated gas required to completely polarize it would be infinitesimally small, and could readily be supplied by the decomposition resulting from a current flow of a few micro-amperes for a thousandth of a second. On this assumption the current flow through the cell before, during and after the passage of a group of oscillations would be something as shown in the curve of Fig. 4.

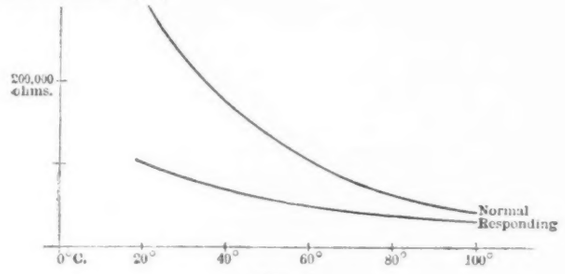


FIG. 4.

The actual observation of this current would require an exceedingly sensitive oscillograph. It is doubtful if our present knowledge of oscillograph construction would enable us to make such an instrument. But our knowledge of the polarization taking place in electrolytic cells with larger electrodes warrants the assumption of very rapid polarization.

Now to determine beyond peradventure that the action of the electrolytic detector is due to a breaking down of polarization, followed by a rapid restoration, several experiments were made under conditions that did not permit of anodic polarization. In one experiment a platinum wire 3 mils in diameter was substituted for the Wollaston wire. This anode gave a fair response when adjusted so that it just touched the surface of the alkaline electrolyte. Substituting for this solution dilute sulphuric acid, a fair response was still observed. The platinum anode was then replaced by an iron wire, also 3 mils in diameter. With this electrode no response could be obtained, even with very strong received oscillations. According to theory, the first action that took place with this electrode was the separation of oxygen at its surface, and the oxidation of the iron. As the oxide thus formed was soluble in the electrolyte it was removed as fast as formed, going into the solution as ferrous sulphate, the anode being rapidly eaten away. The electrode itself acted as the depolarizer in this experiment, preventing the formation of a polarization layer.

In a second experiment another method of preventing polarization was employed. It is well known in electrochemical operations that bright platinum electrodes are readily polarized, an almost infinitesimal amount of separated gas being sufficient. It is stated that the products of the decomposition of one-seventieth of a milligram of water on two platinum plates, each having an area of one square meter, will give an e.m.f. of about 1 volt. In measurements of the conductivity of electrolytes this effect can be practically eliminated by coating the electrodes with platinum black. This is usually accomplished electrolytically, by passing a current backward and forward between the electrodes, the cell being filled with a solution of platinic chloride, containing a trace of lead acetate. In this experiment a platinum wire 1 mil in diameter was used in place of the Wollaston wire. Using an alkaline solution, a very good response could be obtained. This cell was then filled with a dilute platinic chloride solution, and the electrode platinized in the method before mentioned. A very feeble current was used, so that an extremely thin coating was obtained—so thin that when examined under the microscope the diameter of the wire was seen to have been increased by less than 2 per cent. The alkaline solution was then replaced in the cell, and the electrode immersed as before, but no response could be obtained, even when the oscillations were made very strong.

A third experiment was performed, similar to the second, save that a Wollaston wire, thirty-eight millionths of an inch in diameter was used in place of the 1-mil platinum wire. With this wire performing the platinizing under the microscope resulted in a coating so thin that the diameter of the wire was increased by only about ten per cent, or a thickness of two-millionths of an inch. Despite the thinness of the coating the result of this experiment was that of the second; no response being obtained. This experiment has been repeated a large number of times, always with the same result; the thin coating of platinum black either stops the response to the Hertzian oscillations altogether or makes it extremely faint. A strong, vigorous response in the telephone may be entirely stopped by a coating of platinum black too thin to visibly alter the diameter of the electrode as seen under a powerful microscope.

Now according to the thermal theory of the electrolytic detector, advanced by Fessenden, the platinizing of the anode should have but little effect, the increase of diameter being so slight that the dimensions of the minute circumscribed sphere or cylinder of liquid would not be greatly altered. Yet the experiments show an absolute cessation of response.

A fourth experiment was performed in direct consideration of the thermal theory. If this theory were correct, it is evident that an electrolytic detector would operate very feebly or not at all when the temperature of the electrolyte was raised to its boiling point. In fact, as any temperature elevation would generate steam, a reversal of effect might be expected, the resistance increasing in the responding condition. The cell of the detector was placed in a paraffin bath, and the temperature raised from that of the room to the boiling point of the electrolytic solution. The temperature was raised very slowly, and the operation of the detector observed with galvanometer and telephone. It was found that the action of the detector was the same at all temperatures, the only effect of the heating being to diminish the counter e.m.f of polarization, so that a very much lessened potential of the local battery was needed.

The normal and responding resistances of the detector

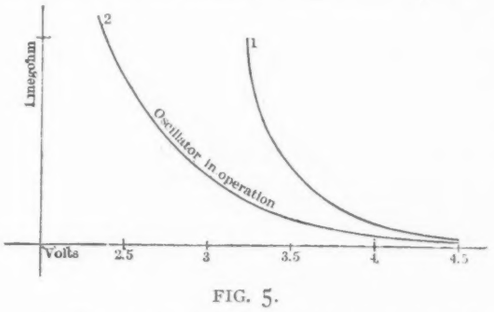


FIG. 5.

are given in Fig. 5, plotted for constant potential of local battery. If the curve is compared with the curves of Fig. 4, a rather striking similarity will be noticed. The effect of heating the electrolyte is similar to that produced by raising the voltage of the local battery. And although the loudness of the response in the telephone receiver is not increased the detector seems to be more sensitive when heated.

In a fifth experiment dilute nitric acid was used in place of the alkaline solution. The result was in no way different,

save that there seemed to be considerable attack upon the anode with the acid near the boiling point.

Look now at another line of proof. It is well known that in general the temperature coefficient of the electrolytes is positive, that is to say, the conductivity of the electrolyte increases with rise of temperature. The conductivity of an electrolyte is dependent upon two factors: (1) The dissociation, and (2) the frictional resistance offered by the solution to the passage of the ions through it. Certain bodies, the weak acids, phosphoric, acetic and hydrofluoric, have negative heats of formation; that is, the heat of dissociation is positive, and, therefore, the dissociation becomes less with increasing temperature. If the temperature coefficient of fluidity either decreases with rise of temperature, keeps constant or increases more slowly than the negative coefficient of dissociation, it is clear that maximum conductivity must be reached at a certain temperature, beyond which any further heating will decrease the dissociation more than it increases the fluidity; and thus on the whole, diminish the conductivity.

Thus in the next experiment an electrolyte with a negative temperature coefficient was used in the detector. This solution was dilute hypophosphorus acid, having a maximum conductivity at about 60 degrees C. Substituting this solution for the alkaline solution a very good response was obtained, the galvanometer showing an increased current when responding, the temperature being maintained at 60-65 degrees C. According to the thermal theory there should have been no response at 65 degrees and above that temperature the current should have decreased.

Again, when the usual alkaline solution was gradually heated to boiling point, no change in the sensitiveness of the wave response could be observed until the violent agitation of the surface due to the boiling destroyed the contact. A 1-mil platinum wire sealed into a glass tube and immersed operates perfectly when the liquid is boiling violently.

From these and many other proofs it is, therefore, evident that the wireless telegraph receiver employing a small electrode or electrodes immersed in an electrolyte depends for its action entirely upon electrolytic phenomena, and can in no sense be classed as bolometer, or barreter, or heat-operated detector.

It is interesting to note the phenomena as the distance between the fine electrode and the other is altered. Consider one electrode a silver sheet covered by a thin layer of electrolyte (water, alcohol, dilute acids or alkali). If the fine point be immersed without touching the silver sheet, we have the action just described, of the normal polarization layer momentarily absorbed or dissipated during the passage of the Hertzian wave train, and the normal apparent resistance of the cell greatly reduced. In this case, of course, the small electrode must be the anode; for if the gas layer surrounding it be hydrogen instead of oxygen, the sensitiveness is very slight. In this case we would expect the thickness of the gas dielectric film to be twice that which oxygen would allow, and that the capacity of the little condenser thus formed would be much less. Again, the hydrogen will be occluded, whereas oxygen will not be, and the polarization phenomena, on which the entire action depends, will be less marked.

Now let the fine platinum tentacle actually touch the metal sheet and become welded to it, by the application of a sufficient local e.m.f. We have here the true hot-wire effect, and the resistance of the device, nominally slight, is increased by the passage of the high-frequency current. Next make the plate the anode and separate from it the fine platinum point by a few thousandths of an inch. A bridge of fine silver particles will form, and by raising the cathode may soon be drawn up out of the liquid. The normal resistance of the responder is slight, and the action of the wave train is to decompose the thin layers of electrolyte between particles of the bridge, as at first described. But it can be shown that both the *increase* and the *decrease* of resistance under the wave influence exist in this latter form, popularly called the anti-coherer.

When one listens in a telephone receiver in the local circuit of the electrolytic anti-coherer to a transmitter giving oscillation groups with sufficient frequency to form a musical note, two distinct sounds are heard. The first, and usually the loudest, is an irregular rumbling sound overlaying the second, which is a pure musical note of the same frequency as that of the transmitter. In the seventh experiment a condenser of small capacity (two or three-thousandths of a microfarad) was shunted around the detector, which was placed in an untuned circuit. This condenser shunt had the effect of suppressing almost entirely the musical note in the receiver, but had very little effect upon the irregular rumble. In an untuned circuit, a condenser shunt has the effect of reducing the potential rise due to the received oscillation; as the rumbling note was but little affected by the shunt, we may assume that this is the anti-coherer action, the breaking down and reforming of the conducting bridge. This is a current-actuated effect and would be but little affected by the shunt. A galvanometer in the local circuit showed a greater decrease of current in the responding state with the shunt on than with it off. This would indicate that there were three states of resistance in the anti-coherer: (1) A very low resistance, due to the conducting bridge; (2) a comparatively high resistant state due to the rupture of the bridge; and (3) a very high resistant state, due to the rupture of the bridge *and the polarization of the broken ends of the bridge.*

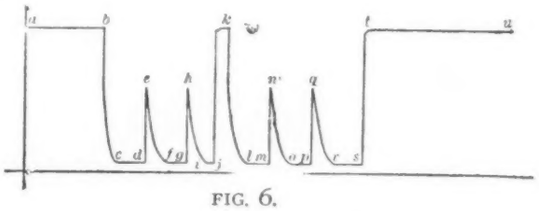


FIG. 6.

Represented graphically, as current flow in the local circuit, the response of this detector to a signal consisting of six impulses would be as shown in Fig. 6. For simplicity the six impulses are considered as single unidirectional impulses. The line *ab* represents the normal current flowing through the anti-coherer when no impulses are being received, and the detector is of low resistance. The first impulse breaks down the bridge, and the line *bc* represents the fall of current due to the rise in resistance, the detector passing rapidly through the second to the third state, or very high resistance polarized condition. The impulses in this signal may be considered to be one-hundredth of a second apart. From *cd* the detector remains highly resistant, and at *d* the second impulse arrives. This second impulse breaks down the polarization, and the detector falls momentarily to the second state of comparatively high resistance. It is then acting as an electrolytic coherer, the rise in current *de* being due to the breaking down of a polarization layer, which is almost instantly reformed, the current falling again as shown by *ef*. This is repeated by the third impulse. Between the third and fourth impulse the bridge succeeds in reforming, but is broken down again by the fourth impulse, as shown by the current fall *kl*. The fifth and sixth impulses operate the device to decrease the resistance, and after the last impulse the bridge has time to reform, shown by the current rise, *st*, the low resistant state *tu* continuing until the next signal. The rumbling note heard in the telephone is due to the occasional reforming of the bridge, as shown at *k*. It will be seen that while the breaking down of the bridge is accomplished by current, the opposite action is due to potential, so that the condenser shunt eliminates the

current peaks *ehmq*, leaving the detector of very high resistance from *c* to *j*, and from *c* to *s*. This not only eliminates the musical note heard in the telephone receiver, but decreases the galvanometer deflection during the responding state. This curve is intended to be an ideal one, and no attempt is made to show real ratios of current.

Returning to the form of the electrolytic detector first considered, it is apparent that, although it is capable of rectifying high-frequency currents, this rectification is not an important action. Like the metal filing coherer, the energy in the local circuit is derived from the local battery, the chief effect of the received oscillations being to release this energy. In its construction certain electrolytes are found to give better results than others. In all probability this is partly due to their relative capacity for absorbtion of oxygen. For example, hypophosphorus acid gives much better results than phosphoric acid, and nitric acid with a certain amount of nitrous is better than nitric alone. As the *ous* acids contain less oxygen than the *ic* acids, this is the probable reason for the difference.

The electrolytic responders which I have described seem to possess in the highest degree the qualities necessary to place the art of aerography on a basis to compete with existing telegraphic service by land as well as sea. They are extraordinarily sensitive; regular in response; strictly quantitative and automatic in action; have approximately constant normal factors as regards resistance and capacity, allowing thus speed of word transmission limited only by the ability of the operators to send and receive. By such means the problem of electrical tuning, or syntony, are enormously simplified; for heretofore the erratic nature of the coherer has rendered it impossible to closely regulate the constants of the tuned electrical circuits in which it is placed, thus making syntonization by its employ at best crude and uncertain.

In regularity of action the responder is strictly comparable with the Rutherford magnetic detector as developed by Wilson, Shoemaker, Marconi and Ewing; while as regards relative sensitiveness there is to-day no comparison between that of the magnetic detector and the electrolytic receiver. Moreover, the device is practically indestructible, while its syntonizing qualities enable us to so cut out foreign signals and electric disturbances as to render wireless communication by this means immune from interruption where the coherer or less sensitive magnetic detector is an impossibility.

A HEARTLESS TELEPHONE MANAGER.

Turtle Creek is a Pennsylvania community and, in a small way, a town of not a little importance, boasting among other things a jam-up telephone system. It is the telephone system of the town that has brought public attention to the place for the moment. The whole working force of the switchboard is out and the line is out of business, or at least, it was up to the time of writing these lines. Not that there has been any strike. Not a bit of it. The five young ladies who officiated at the board were not strikers by a jugful. But by some strange coincidence, all five became victims of the love epidemic that raged in the community, and got married at about the same time, leaving the switchboard to switch for itself, so to speak.

That was all right. Our best wishes to the ladies and their lords. But the telephone manager is the man we are after. He was so upset by the sudden loss of his five operators that he has determined to avert the calamity of a marriage plague in his diggings in the future, if possible. He has drawn up what he deems to be an ironclad contract by which the operator in each case agrees to remain unmarried for a period of one year.

It is related that he has a number of applications for positions, despite this unreasonable requirement, and that eventually his line will be in good running order again. Let us hope that it will. But we are curious to observe the workings of the contract. School boards have had pledges of this character and so have other concerns which make a specialty of female labor. But it has been observed that when Cupid takes a contract of that sort in hand, he busts it all to flinders. When the telephone girl takes it in her head to marry, she is going to marry, telephone or no telephone, injunction or no injunction, contract or no contract.

And we are all glad that it is this way; and it is going to remain this way, unless, indeed, the telephone girl becomes engaged to some second lieutenant in the army, after Corbin puts the wedding beyond the reach of the subalterns.

Another thing: How will Roosevelt regard this palpable blow at the integrity of the race? He has preached often and eloquently against all influences which tend to restrict the multiplication of the human species at home and it seems there could be no surer way to limit our constantly diminishing output than to restrict marriageable persons from following the bent of their minds and hearts.

The Turtle Creek manager will have to change his tactics. He must raise wages and employ men or else select girls that nobody will have. *A bas* the Cupid-less telephone office. *Conspuez* the telephone manager who is an enemy of Hymen.

NEW TELEPHONE TESTS.

With a view to making improvements in the present telephone system and to test the invention of Professor Michael I. Pupin of Columbia the telephone companies with headquarters in New York city have established lines in accordance with Professor Pupin's system, and already many satisfactory results have been determined.

By placing coils wound on wire at regular intervals on a circuit Professor Pupin found that the current was transmitted without interference of waves or loss of current. To apply this discovery practically a New York telephone company has installed an underground cable to Kings Bridge, another company is experimenting with an underground line between New York and Elizabeth and two lines on Long Island, and the long-distance company is testing overhead Pupin lines to Omaha, St. Paul and Boston.

The first practical application was the laying of the cable to Kings Bridge, which the New York company has just completed at an expense of $200,000. Some of the wires are in use now and have satisfactorily accomplished the results expected. This same company has applied Profesor Pupin's ideas to its long-distance overhead lines and now has been experimenting with them for more than a year. The results have been generally satisfactory, but some minor difficulties—for example, the effect of lightning on the Pupin wires—have been encountered.

Professor Pupin expects that his new system will revolutionize the construction of telegraph cables and make possible telephone communication between New York and London. Heretofore what is known as the "resistance" of the cable has made telephoning across the ocean an impossibility. Even in ocean telegraphy if the speed of transmission is accelerated beyond a certain point the sounds are confused at the other end of the wire on account of this resistance. It is toward the overcoming of this resistance that Professor Pupin has spent several years of study, research and experiment.

A Belvidere, Illinois, paper prints the following: "A woman in this city gave her telephone an energetic ring the other day and inquired hurriedly, 'Have you any brains?' The answer astonished her. 'Yes, but I don't believe you have any.' Then the woman remembered that she had forgotten to tell central she wanted the butcher shop."

Telephone Eclipses Bellboy

EVERYBODY who has traveled is familiar with the bellboy, varying in type from the untidy and eternally weary specimen inseparable from a certain class of back country "hotels" to the trim and ready youth who officiates in typical first-class metropolitan hostelries. But in the large cities, during the last half dozen years, the gradual adoption of the telephone has materially changed his labors, if not his outward appearance. Now in the latest New York hotel, the $7,000,000 Hotel St. Regis, his eclipse is predicted; the bellboy is to disappear from public view entirely, and, with others of this kind, await the call of duty in a room especially set aside for him and the operators at the telephone switchboard.

This is an innovation that may or may not find favor with other hotel proprietors, and it probably will be many years before the familiar row of beliboys, in their smart uniforms, will cease to decorate the main office of the great urban caravansary. But the telephone is becoming indispensable. No important hotel is built nowadays without its complete telephone equipment, and many of the older houses are putting in similar systems. It is less than ten years since the telephone companies installed the first of the hotel exchanges, but, although still young enough to be classed among the "latest things," the changes they have already brought about in hotel living furnish an unusually interesting example of applied invention, carried much further than even Gray or Bell probably imagined.

The adoption of the telephone on the large scale in which it has to be handled in a big hotel, where every room has its separate instrument and the temporary owner may put down his gripsack and enter into immediate conversation with his family, a business partner, or anybody else hundreds of miles distant, has produced changes in hotel living that would strike the traveler of even ten years ago as little short of miraculous.

Under the old regime the guest communicated his wants to the office by a series of bell signals, or an electric indicator, as is still the case in many even of the large hotels of America and Europe. All this bell signaling, which, under the best of circumstances, consumes time and has a tendency to make the guest feel as if he were ringing in a fire alarm, bids fair sooner or later to be done away with not only in the larger, but in the smaller, American cities. In the thoroughly modern hostelry, no matter what the guest wants, he now goes to the telephone, calls the office, states his desire, and awaits the result. And the modern bellboy—sometimes not a boy at all, but a man who has grown to middle life in the service—is very much like an automaton electrified by the telephone summons. He does not have to go to the guest's room to find out what is wanted; the telephone saves the trip; but he puts the order into effect in the quickest possible time, because his actions are all a matter of record and his chances of promotion—to say nothing of the simpler process of merely holding down his job—depend directly upon his ability to be almost as quick as the telephone itself.

In many cases, of course, the telephone does away entirely with the need of a bellboy's services. The guest for example, wishes to ask some question about trains, the breakfast hour, what is going on at the theaters, or how long it will take him to go from one part of the city to another—questions that, before the invention of the telephone, would have necessitated ringing for a boy, asking him the question, and awaiting until he had gone back to the office for the exact information. But nowadays the guest simply takes down his telephone receiver and asks the clerk, who is a true, handy encyclopedia of useful knowledge for doubtful strangers, and who tells him what he wants to know without leaving his desk in the main office. Or the guest, perhaps, wants a few moments conversation with somebody else whom he knows is staying in the same hotel—and here again he avoids having to call a boy to find out whether the other guest is receiving callers and avoids the necessity of "dressing up" for his call, a call by telephone being quite as "proper" in a dressing gown as in any other costume.

Particularly in large apartment hotels, where the guests are mostly permanent residents, these telephone calls are in constant progress. "Society," it is said, has even evolved a system of etiquette for telephone callers. And in the case of a party of friends traveling together the value of the system is equally obvious, for however far apart they may be quartered in the same hotel, the telephones from room to room enable them to communicate as freely as if they were all living in one large suite of apartments.

The bellboy of a large hotel leads a busy life. He is always on duty, for there is no hour of the twenty-four when he is not likely to be called upon, and the telephone system of the hotel, with its 200 or 300 telephones, is like a big metropolitan system with thousands of connections. Day or night it is always in operation, part of the time working independently, simply assisting conversations from one part of the hotel to the other; while at other times it becomes part of the larger system, and the individual guest has at his service the use of some miles of wire to talk with somebody in the city or the use of several hundred miles of wire to converse with somebody at a much longer distance. Each room in a city where there are no competing companies, is thus connected with every other telephone in the city.

Telephones naturally were first placed in the rooms of large city hotels, but the system is year by year finding favor in smaller and smaller places. It not only reduces the number of bellboys, but in small hotels operators are not necessary, the clerks being able to operate the switchboard beside attending to their other duties. Moreover, the hotel proprietor finds that the telephone is a source of revenue, because he shares with the company the toll receipts. The bellboy is still indispensable in hotel management, and will remain so; and the telephone is his valuable ally, beside performing many duties outside his province.

RIFLE PRACTICE SERVICE IN NEW YORK.

Alluding to the telephone service in New York city, the New York *Times* has a complaint to make. "The constant buzz of the system, the frequent small explosions which sound like pistol shots, and the variety of odd sounds which the wire brings to one who obeys the injunction to 'hold' it subject to the convenience of another, cause the average person to leave the instrument with the unalterable conviction that his hearing on the left side has been permanently impaired. It is sometimes an hour before the disagreeable sensation of rifle practice inside one's head passes."

The telephone systems of the United States make use of nearly 6,000,000 miles of wire.

In the Financial Field

The Home Telephone Company of Utica, New York, is now earning nearly 7 per cent on its stock.

It is stated that the Keystone Telephone Company has extended its $1,400,000 loan on the original basis.

At a meeting of the Clifton Park Telephone Company, at Round Lake, New York, a dividend of 8 per cent was declared.

It is reported that the United States Telegraph and Telephone Company's stock will be sold to the highest bidder, in Chicago.

The Delaware and Madison County (Indiana) Telephone Company recently declared a six months' dividend of 1½ per cent.

It is reported that the Cuyahoga Telephone Company of Cleveland will pay a dividend on its common stock after January 1, 1905.

A semi-annual dividend of three per cent was declared at the monthly meeting of directors of the Valley Telephone Company at Syracuse, New York.

The Pomona Valley (California) Telephone and Telegraph Union has just made the first semi-annual payment on an annual dividend of 8 per cent.

The Fort Wayne (Ind.) Home Telephone Company at a meeting of its directors authorized a one per cent semi-annual dividend of one per cent, payable October 25.

The Kinloch Long Distance Telephone Company of St. Louis has increased its capital stock from $2,000,000 to $3,000,000, and will use the new capital to extend its lines.

The stockholders of the Inter-State Telephone Company of Dubuque, Iowa, at a recent meeting re-elected the old officers for the coming year and declared a dividend of 12 per cent.

The board of directors of the Providence, Rhode Island, Telephone Company, at a recent meeting, decided to increase the capital stock of the corporation from $1,600,000 to $2,000,000.

The Strowger Automatic Telephone Company of Chicago is said to have closed contracts last month which will net enough on the shares for the year to enable the payment of a 2 per cent dividend.

The Citizens' Telephone Company of Decatur, Indiana, has increased its capital stock from $5,000 to $60,000. Extensive improvements will be made and new equipment installed, including a new and up-to-date switchboard.

It is reported that the Inter-State Independent Telephone and Telegraph Company, with offices at Aurora, Illinois, Chicago and Jersey City, has given a trust deed for $50,000,000 to the American Trust and Savings Bank as trustee.

The directors of the Citizens' Telephone Company of Grand Rapids, Michigan, declared the usual quarterly dividend at the regular monthly meeting held recently. It was also determined to construct 100 miles of toll lines where it was deemed necessary.

The Union Trust Company of Cincinnati and the Dayton Savings and Trust Company of Dayton, Ohio, have purchased the $250,000 bond issue of the Home Telephone Company of Dayton at almost par. The company will retire bonds bearing a higher rate of interest.

At the last regular monthly meeting of the Newark (Ohio) Telephone Company it was voted that a quarterly dividend of one per cent be declared to holders of the company's common stock. The regular semi-annual dividend of three per cent will be paid on the preferred stock on January 1, 1905.

The directors of the South Bend (Ind.) Telephone Company at a recent meeting authorized a dividend of one per cent, semi-annual, payable October 20. The report showed that the company has spent $45,000 on new equipment this year and has $21,000 on hand available for further improvements or for surplus.

A trust mortgage has been given by the Boone County (Iowa) Telephone Company in favor of J. H. Herman, of Boone, trustee, for $50,000. It is understood that the money is to be used in the improvement of the telephone system, which enters Des Moines and covers a large territory in Boone and adjacent counties.

The officers and directors of the Home Telephone Company of Riverside, California, at a recent meeting voted to issue $500,000 worth of bonds to raise money for the completion of the system building in that city. Only $200,000 will be issued at the present time; the remaining $300,000 will be kept as a reserve fund.

A Cleveland broker of good standing and of good financial backing approached Col. Dickson, president of the Federal Telephone Company, recently and asked for an option on the control of the United States Telephone Company and the Cuyahoga Telephone Company. Col. Dickson replied that he would not talk the matter over until he knew absolutely who desired the properties, and why they desired them. Mr. Dickson stated that neither of the companies would ever be sold save to strong Independent telephone men.

The Citizens' Telephone Company of Columbus, Ohio, offers for $100 a share $300,000 of 6 per cent cumulative preferred stock, dividends payable quarterly from October 1, 1904, the proceeds of which will be used for enlarging the capacity of the telephone plant to 8,000 main line telephones and an ultimate capacity of 19,000 telephones.

The Franklin County (Ohio) Telephone Company is arranging to make a number of improvements in its service outside of Columbus and will attempt to place a telephone in almost every farmhouse At the annual meeting of the company a bond issue of $100,000 was authorized and if the money is needed for the proposed improvements the issue will be placed on the market.

By the transfer of a block of stock recently the Federal Telephone Company of Cleveland reduced its liabilities $600,000. Later it was announced that the Federal company had concluded arrangements for borrowing $450,000 from a syndicate of Cleveland and New York capitalists, all of which will be issued for the extension of the long distance lines of the United States company through Ohio and adjoining states.

The Keystone Telephone Company of Philadelphia reports net earnings of $91,973 for the quarter ended September 30. This compares with $61,156 for the corresponding quarter last year, $78,960 for the March, 1904, quarter, and $86,241 for the June, 1904, quarter. For nine months ending with September of this year the company has made total net earnings of $257,124, which compares with total profits of $232,515, for the entire twelve months of 1903.

The annual meeting of the stockholders of the Federal Telephone Company was recently held at East Orange, New Jersey. R. W. Judd, treasurer of the company, represented the stockholders. It is the plan to continue the same organization for such period of time as may be required to work the affairs of the company around to final solution and get the finances on a permanent basis. The statement for the year will be much better than the statement for the preceding year.

The Home Telephone and Telegraph Company of San Diego, California, is placing on sale $100,000 of its first mortgage 5 per cent thirty-year gold bonds, on a basis of $1,000 bonds and $1,000 stock for $925, of which 25 per cent is to be paid down and the balance not exceeding 15 per cent monthly with accrued interest. The bonds are dated July 15, 1904, and are due thirty years hence, subject to call after 1914 at 105 and interest. A sinking fund is to be established after 1909 consisting of 10 per cent of the net earnings.

At the semi-annual meeting of the Northwestern Ohio Telephone Toll Line Company a dividend of 5 per cent was declared, an increase of one per cent over the dividend formerly paid. The company is doing an excellent business. There is very little of the stock on the market and it is held around 40. The company has outstanding $40,000 bonds, and beside paying a dividend of 4 per cent on the stock, retired a $1,000 bond last year. This is a Barber & Brailey enterprise with James E. Brailey, president, and Charles Peckham, secretary.

The stockholders of the People's Telephone Company of Birmingham, Alabama, have decided favorably on the proposition to cancel the present authorized issue of bonds for $100,000 and an issue of $200,000 worth of 5 per cent 20-year gold bonds has been authorized. The new bonds will be first mortgage bonds and will be secured by trust deed or mortgage of all the company's property and franchises. The proceeds of said issue will be used to pay off the present indebtedness of the company and provide funds for the growth and extension of the plant.

A Toledo paper says: "The unwonted activity in telephones during the past week or ten days is without precedent in the local stock market. The Independent telephone movement has been lagging somewhat, but there are indications of an advance all along the line in these securities. Quite a number of Toledo capitalists were interested in the Utica-Rome Independent deal and made good winnings. Just what is back of the remarkable advance in the price of Toledo and Louisville telephone securities is not known, but that they have jumped about 15 points in 15 weeks is in itself significant. It is even more significant that the buying of these securities appears to come from the inside. The Barber-Brailey syndicate is picking up everything that is offered in Toledo and Louisville, and it is intimated that they are being backed by an eastern syndicate of great wealth and responsibility."

PERSONAL

E. N. Egge has purchased the Thornton (Iowa) telephone exchange.

H. H. Jones has sold the telephone system at Syracuse, Kansas, to Clarence Daigh.

William Kroatter has completed an automatic telephone system in Spencer, Iowa.

L. J. Pettijohn and others have been granted a franchise at Dodge City, Kansas.

J. E. Collins is promoting an automatic telephone service for San Marcial, New Mexico.

F. E. Bell has sold the Wayne, Nebraska, telephone system to Arthur Overshiner of Chicago.

J. H. Robinson has sold the Tuscola (Ill.) Telephone Company's plant to J. S. Campbell.

Dr. J. J. Risk has purchased the exchange of the Memphis (Mo.) Telephone Company for $7,000.

L. M. Lasley is figuring on a telephone line between San Marcial and Rossdale, New Mexico.

Milliken, Wren & Porter are building a telephone line from Sherman to Island Falls, Maine.

Wilford Conley has been appointed manager of the local telephone company at West Bend, Iowa.

C. J. Sturgeon has put in a 150-drop switchboard in the telephone exchange at Edgerly, North Dakota.

H. C. Hackney has resigned as manager of the Zenith Telephone Company, at Duluth, Minnesota.

G. L. Sterns has been elected general manager of the Enterprise Telephone Company at Pipestone, Minn.

N. C. A. Sauls has been appointed superintendent of the Colleton County (S. C.) Telephone Company.

W. F. Crutcher has sold the telephone exchange at Lonoke, Arkansas, to J. A. Bell and W. H. Young.

L. Breitenbach has secured a franchise from the trustees of Sonoma, California, for a telephone system.

James Kirk has been appointed manager of the Osakis (Minn.) Telephone Company, to succeed Harry Kent.

Mager & Camden have installed a telephone exchange at Wallhalla, North Dakota, with sixty subscribers.

J. H. Young has been awarded the contract for building the telephone line from Gallup to Zuni, New Mexico.

H. L. Purdy has resigned as local manager of the Home Telephone Company's exchange at Whitesboro, New York.

Lewis Blakenhorn has presented a petition for a franchise for a telephone and telegraph system in Santa Monica, California.

Holmes Brothers are promoting a telephone system in the Rucker and Orchard districts in Santa Clara county, California.

W. B. Bascom, the new owner of the exchange at Harvey, North Dakota, will rebuild the plant, installing a central energy system.

Jackson Lurvy, president of the local telephone company at Oakfield, Wisconsin, died of apoplexy recently. He was 58 years of age.

P. C. Holdoegel of Rockwell City, Iowa, is remodeling his telephone system in Manson and vicinity. He expects to spend $4,000.

W. D. D'Varney has presented a petition to the city council of Salem, Oregon, asking for a franchise to install a telephone system.

S. J. Curtis, J. W. Talbot and Dr. C. C. Talbot have organized a $10,000 company to establish a telephone system at Seaside, Oregon.

K. G. Comfort and Thomas Cates of Westville, Indian Territory, have bought a half interest in the Stillwell telephone system.

George Norton of Santa Barbara, California, has applied for a franchise for the installation of a telephone system at Bishop, California.

W. B. Bascom, who recently purchased the Harvey, North Dakota, exchange, will rebuild the system, installing a central energy system.

H. D. Edmonds has sold his telephone exchange at McLouth, Kansas, to Sellers & Son of Haddam. O. G. Sellers will manage the business.

R. G. Crane has been appointed manager of the Home Telephone Company's exchange at Long Beach, California, in place of J. D. Love, resigned

E. C. Starks has resigned the management of the Wood County Telephone Company at Grand Rapids, Michigan, to take charge of the Northern Rural Telephone Company's system at Spencer, Wisconsin.

Thomas Drake, the electrician who invented the Drake telephone, which requires no central office, died at McConnellsville, Ohio, recently, aged 30.

J. D. Love has resigned his position as manager of the Home Telephone Company, at Los Angeles, California, and is succeeded by R. N. Crane.

Homer Hood, of Toledo, Ohio, has asked the city council of Cleveland for a franchise for the construction of an Independent telephone exchange.

M. W. Mitchell of Wilkesbarre, Pennsylvania, has been appointed manager of the Cleburne, Texas, telephone exchange, vice Mr. Vanwormer, resigned.

P. E. Fraley has resigned as secretary and treasurer of the Woodsfield (Ohio) Telephone Company, and F. A. Jeffers has been elected to the vacancy.

G. S. Van Eman and others are forming a company to build several lines of telephone, and propose to parallel the lines running out of Jennings, Oklahoma.

E. J. Cooper of Minneapolis has been looking over the ground with a view to building a telephone line between Two Harbors and Grand Marais, Minnesota.

W. B. West has resigned his position as manager of the Pioneer Telephone Company at Chandler, Oklahoma. Frank E. Beeman of Wellston succeeds him.

F. L. Von Almen has been appointed manager of the Fox River Valley Telephone Company at Appleton, Wisconsin, to succeed F. T. Green, resigned.

Henry Sisler of Red House, Maryland, and P. F. Snyder of Sunnyside have organized the Red House Telephone Company and will build a telephone system.

E. H. Sidwell and others are organizing a new telephone company at Estherville, Iowa. The question of a franchise will be voted upon at the November election.

Manager Gerow of the Meade (Kan.) Telephone Company, reports that he expects to complete negotiations for long-distance service with eastern lines soon.

F. G. Davis, in behalf of the Home Telephone Company of Troy, Ohio, has asked the city council of Tippecanoe City, Ohio, for a franchise to operate in that city.

Messrs. F. G. Taggart and William H. Rust, proprietors of the Richmond (Mo.) Telephone Company, will improve the service by installing a new switchboard.

J. S. Haley of Independence, Missouri, has sold the Independent telephone exchange at Knobnoster to the Kinloch Long-Distance Telephone Company of St. Louis.

W. A. Conklin and others have purchased the telephone lines owner by W. C. Fellis, Ben Heer, the State Bank and G. E. Decker, at Table Rock, Nebraska.

E. L. Cline, superintendent of the Home Telephone Company at Utica, New York, and family recently made a trip through Ohio They also visited the St. Louis fair.

George A. Briggs, president of the Chicago Telephone Supply Company of Elkhart, Indiana, recently made a business trip to New York and return in his automobile.

Charles W. Taylor of Detroit has been granted permission to enter Albion, Michigan, after the committee which had investigated the matter had reported against such action.

F. Leonard, manager of the Topeka & El Reno Telephone Company, at Anadarko, Oklahoma, recently made connections between his company and the Spring Creek Rural System.

Ernest R. Webber of Forest, Ohio, secretary-treasurer of the Orange (Texas) Telephone Company, has taken charge of the telephone plant at Orange, succeeding Frank Pfeiffer.

B. F. Clark of Perry Springs (Ill.) has purchased a controlling interest in the stock of the Siloam Telephone Company, which owns the Clayton telephone exchange and connecting farm lines.

Henry Greenler is president of the Farmers' Telephone Company of Highland township, Defiance county, Ohio, which will have connection with twenty-eight other systems of the same kind.

O. M. Annis, manager for the Pioneer Telephone Company, at Blackwell, Oklahoma, has been placed in charge of new work in the Indian Territory. Will Humphries is his successor at Blackwell.

Dr. McCullough has sold the Herington, Kansas, telephone exchange to J. J. Clark & Son of Lawrence. The Clarks operate several exchanges in eastern Kansas with headquarters at Oskaloosa.

Wareham & Wood, proprietors of the telephone company at Chanute, Kansas, contemplate the erection of a new building and the installation of new equipment at an estimated cost of $25,000.

Evan D. Hubbard, who recently removed from Detroit to Battle Creek, Michigan, to engage in the electrical business, has been appointed superintendent of the electrical lines of the Grand Trunk,

having charge of all telephone and telegraph wires, signals and appliances.

John R. Hart, manager of the Independent Telephone Company, at Hailey, Idaho, will extend the lines. The company has three exchanges, Hailey, Bellevue and Shoshones, Hailey being the headquarters.

J. K. Norstrom, president of the Automatic Telephone Company of Chicago, has been enjoying a well-earned rest in the mountains of Colorado. H. U. Graif, treasurer, has been in full charge during his absence.

R. O. Brush of Middleport, New York, has been appointed manager of the Home Telephone Company's system at Batavia, New York, to succeed J. C. Burton, who takes charge of the system at Dunkirk.

A. F. Ramsey, president of the Home Telephone Company of Crawfordsville, Indiana, has contracted with the long distance company of Indianapolis for a new long distance line from Crawfordsville to that city.

Manager Houseman of the St. Louis (Mo.) County Telephone Company, says the company will be in operation as far as Kirkwood within the next month, and that the entire county system will be installed by spring.

F. L. Underbyer, who was for some time electrician for the Marysville (Kan.) Telephone Company, is now located at Fairbury, Nebraska, where he has a position as engineer with the Fairbury Electric Light Company.

Bertram E. Laciar, manager of the Interstate Telephone Company, has closed negotiations with the school commission, at Trenton, New Jersey, for the installation of Interstate telephones in the public schools of that city.

Frank Lathrop, representing the Georgia Telephone Company of Atlanta, Georgia, has asked the city council of Athens, Georgia, for a franchise for his company. There is a general impression that the franchise will be granted.

F. C. Toepleman, general manager of the Weldon (N. C.) Home Telephone Company, is making arrangements to install a new switchboard at that place, rebuilding all the lines, using cables and reconstructing the system generally.

A. Hironimous is building a telephone line from Arlington, Oregon, by way of Cleveland and Jersey to Brickleton, Washington, upon completion of which he will construct a line to Mabton, Washington, by way of Blue Light and Glade.

J. S. Newell, president of the Citizens' Telephone Company of St. Joseph, Missouri, and Jesse S. Funston, president of the Funston Telephone Company, both deny the report that their companies have been absorbed by the Gould system.

Harry S. Grant, the Indiana representative of the Century Telephone Construction Company of Buffalo, New York, is permanently located at 311 North Illinois street, Indianapolis, Indiana, where he will be pleased, at all times, to meet his friends.

J. T. Spencer, general manager and secretary of the Whittier (Cal.) Home Telephone Company, recently visited Kansas City, St. Louis, Chicago and New York. While in Chicago Mr. Spencer purchased material for reconstructing the system at Whittier.

Postmaster C. H. Forrest of Daleville, Indiana, has sold his stock in the local telephone plant to Frank E. Barber, who will also assume Mr. Forrest's duties as secretary and treasurer of the telephone company, the change taking place November 1.

T. S. Maude of Burbank, South Dakota, has applied to the county commissioners for a franchise for the construction and operation of a telephone line through Union county from Burbank to Spink. Nels Anderson, also of Burbank, is associated with Mr. Maude.

J. G. Sigler has been appointed manager of the Kinloch Telephone Company's exchange at St. Charles, Missouri. The former manager, George P. Player, who has been appointed wire chief of the company's long-distance service, will be located in St. Louis.

J. A. Gordon of the International Telephone Manufacturing Company, Chicago, has been put in charge of the new construction work of the public service telephone system in the town of Neepawa, Manitoba, which system is being practically doubled in capacity.

J. W. Hockenberger and Louis Goldberg of Marion, Wisconsin, representing the Marion and Northern Telephone Company, which covers considerable territory in the southeastern part of Shawano county, are planning to construct a telephone system in Shawano.

H. G. Slater has been appointed by the Citizens' Telephone Company, Oshkosh, Wisconsin, manager for the ensuing year. Mr. Slater now has charge of the Independent exchanges at New London, Weyauwega, Waupaca and Sheridan and connecting toll lines.

F. B. McElrop and others have petitioned the city council of Dallas, Texas, for a franchise to construct and operate an Independent telephone system in Dallas for a period of twenty years. They offer a bonus of not less than $50,000 during the life of the franchise.

Frank B. Hall, who figured in the construction of the Utah Independent Telephone Company's exchange at Salt Lake City as chief engineer, has returned east and expects to remain during the winter, having accepted the position of engineer for the Ohio Valley Telephone Company, at Bellaire, Ohio, where a handsome new exchange building is to be erected.

W. A. Porter, who has been manager of the Independent telephone exchange at Waxahachie, Texas, since it was established three years ago, has resigned to engage in other business. He has been succeeded by Tony Schafer, formerly manager of the exchange at Ennis.

M. H. Spere and associates have been granted a twenty-year franchise by the city council of Manitou, Colorado, to construct and operate an Independent telephone system. Articles of incorporation have been drawn up for the new company, placing the capital stock at $500,000.

C. W. Odell, manager of the telephone system at Del Rio, Texas, and A. J. Combs of Illinois will construct a telephone system in Brackett, Texas, and a long-distance system, to connect Brackett with Del Rio and Uvalde, where it will connect with the line extending from San Antonio.

George L. Wilson has been granted a franchise at Pell City, Tennessee, and within a short time the line will be under construction. It will connect Pell City, Eastonville and Coal City. Mr. Wilson is general manager of the Oconee Telephone Company at Walhalla, South Carolina.

Messrs. Lee, Briggs, Wilhelm, Meyers and Jerge, representing the Elma Telephone Company of Elma, New York, have asked the board of trustees of Lancaster, New York, for a franchise to allow them to enter the city, and the matter has been taken under consideration by the trustees.

J. E. Baumrucker is now connected with the Chicago Writing Machine Company of Chicago, having been placed in charge of the sales department devoted to adjustaphones and the Chicago telephone holder. He is an excellent salesman and the company is fortunate in securing his services.

John Hesketh, electrical engineer of the Postmaster-General's department, Brisbane, Australia, recently spent ten days in New York. Mr. Hesketh was a delegate to the International Electrical Congress, and was looking into the telegraph and electrical systems of this country before his return home.

Joseph Vater, manager of the Royal Hungarian office of telegraphs and telephones, of Budapest, Hungary, spent several days in Chicago recently, inspecting the systems of the local telephone companies. He was shown through several of the exchanges and expressed surprise at the advanced methods in vogue there.

E. T. Gable has sold his half interest in the Cullman (Ala.) Telephone Company to S. L. Sherill of Hartselle, who owns the Hartselle telephone system. The interests will be combined and the system improved and extended. Walter Gable, son of W. T. Gable, is the owner of the other half interest in the concern.

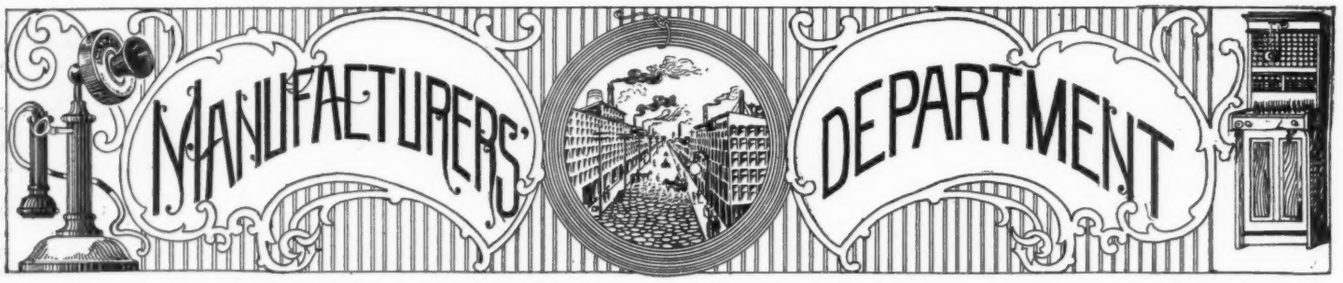
James S. Cummings of St. Petersburg, Russia, who left the United States some years ago, and who has been making a tour of the American cities, has started on his return voyage to Russia. Mr. Cummings has large contracts for conduit work in London and St. Petersburg, and it is for the completion of these that he now returns.

President A. B. Kerlin of the Devil's Lake, North Dakota, Improvement Company has just received the contract from headquarters of Indian affairs at Washington for the immediate erection of a telephone line between Devil's Lake and Fort Totten. Work on the new line will be commenced immediately and will be completed before January 1, 1905.

J. E. McSweeney, who has become widely known in the telephone manufacturing field as general manager of the Globe Automatic Telephone Company of Chicago, has severed his connection with the Globe Company to assume the management of the newly organized Automatic Telephone Construction Company, which has for its object the installation and operation (on its own capital) of automatic telephone exchanges throughout the United States and in other countries.

William A. Hall recently branched out in business for himself at Cincinnati, Ohio, as manufacturer's agent of telephone and electrical supplies. Mr. Hall is one of Cincinnati's best known men in this line, having been engaged in business in that city six years. Prior to that time he lived in Boston, where he received his business education. He has had thirty years of experience in manufacturing and selling electrical goods, which fully qualifies him to conduct an enterprise such as he is now engaged in.

Hall L. Brooks, head of the Hall L. Brooks Lumber Company of Tomahawk, Wisconsin, and whose white cedar poles have made him well known in the telephone field, is a candidate for the legislature on the Republican ticket in his assembly district. Mr. Brooks is a man of energy and unusual ability and *The Tomahawk*, published in his home town, says of him: "He is highly esteemed by every farmer and lumberman with whom he has had business transactions. He is a man whom all Republicans may unite in support of and feel assured that he will be an honor to his constituents and the state."

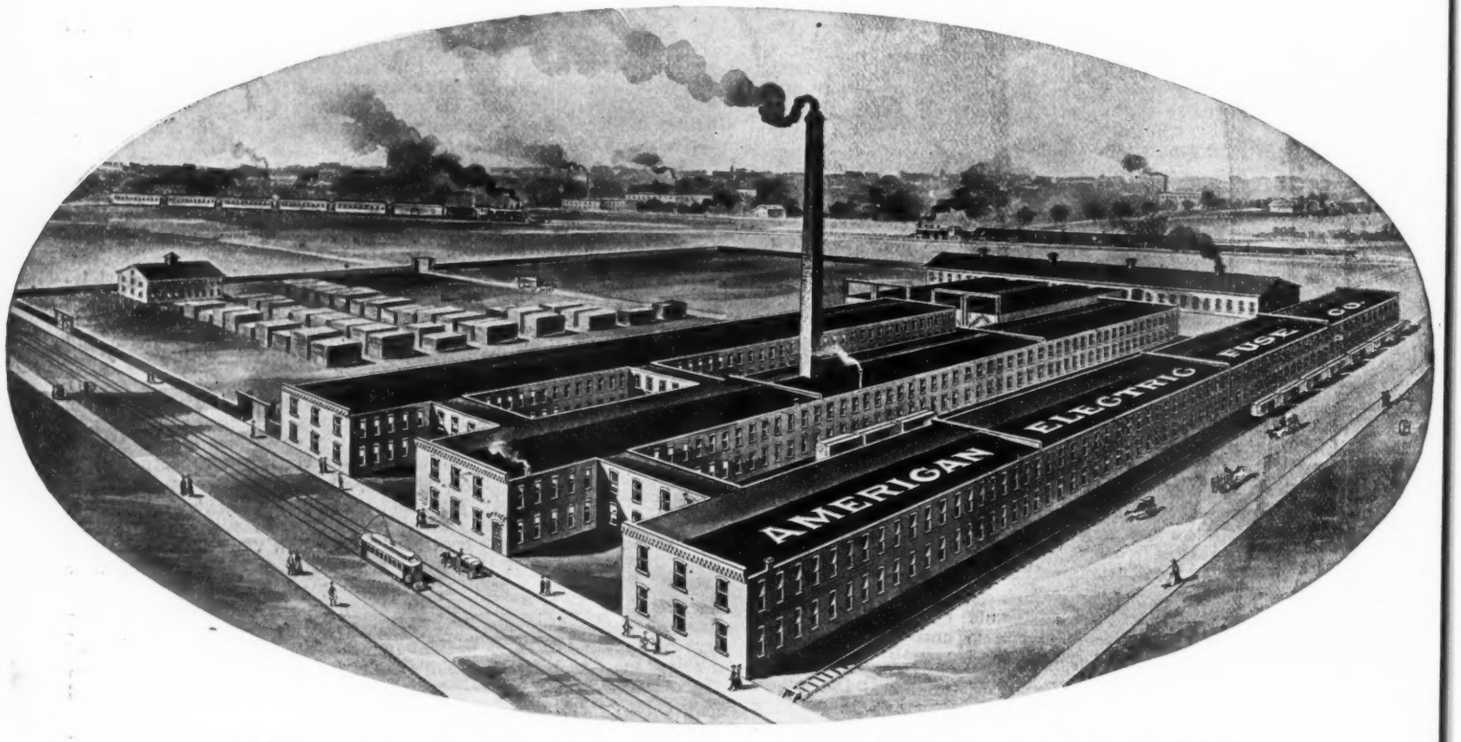


AMERICAN ELECTRIC FUSE COMPANY.

The American Electric Fuse Company of Chicago was organized in 1892. It is, therefore, one of the oldest manufacturing companies in the Independent telephone business. Its first factory consisted of one small room and its first pay-roll contained the names of only two workmen. The company was organized for the manufacture of the Maxstadt mica fuse and a single pole fuse block designed for use with that fuse. At that time the future extent and possibilities of the Independent telephone business were unthought of.

The first sale made by the company was on August 2, 1892, and consisted of 150 single pole fuse blocks and 300 1-ampere foil terminal mica fuses. This sale was made to the Western Union Telegraph Company of Chicago. The fuse blocks were made with wood bases, and the fuse was made by clipping off a very thin and narrow piece of tinfoil, gluing it to a piece of mica and pasting other pieces of tinfoil at each end of the mica strip to make terminal contacts. The device, while very crude, was a great improvement over any similar type of protector. It found immediate favor with the Western Union Telegraph Company, but the sales at first were confined to that company only.

The mountings used upon the first fuse blocks were made with a brass plate and a spring clip. Having been sold to the Western Union Telegraph Company this form of mounting became known as the Western Union style of fuse block. Later on the Postal Telegraph Cable Company placed orders with the American Electric Fuse Company for mica fuses slotted at each end and designed to be held in place on the fuse block by screw contacts. To distinguish these fuses and fuse blocks from those furnished to the Western Union Telegraph Company, the second type was called the Postal style. As Western Union and Postal styles these two types of fuses and fuse blocks have been known ever since.



MANUFACTURING PLANT OF THE AMERICAN ELECTRIC FUSE COMPANY AT ADRIAN, MICHIGAN.

Shortly after the first sales to the Western Union and Postal Telegraph companies, a number of sales were made to the fire departments of various cities, but not until July 1, 1895, was any sale made to a telephone company. The Chicago Telephone Company made the first purchase of sixteen single pole fuse blocks, Western Union style. By this time the company had made porcelain molds for its fuse blocks, and was furnishing the bases of porcelain instead of wood. From that time on, the progress of the company in the telephone field was rapid. Its first sales were to the Chicago and Central Union telephone companies, but before the end of 1895 shipments had been made to a number of jobbers for telephone exchanges.

In 1896 the company's business began to grow very rapidly. The number of employes had increased to over twenty per cent by the first of January, 1896, and during the following year a still further increase, amounting to almost 100 per cent, was made both in the business of the com-

pany and the number of its employes. About this time the company began the manufacture of wire connectors in addition to its fuses and fuse blocks, and it also placed upon the market a number of new designs of protectors. In 1898 the business of the company had grown to about $40,000 a year, and at that time the present president of the company, Frank G. Jones, bought a half interest in the company, and became its secretary and treasurer on July 8, 1898, F. W. Maxstadt being president of the company and owning the remainder of the company stock. Mr. Jones and Mr. Maxstadt continued in business together until May, 1900, when Mr. Maxstadt retired from the company, Mr. Jones purchasing his entire interest. Mr. Jones became president of the American Electric Fuse Company on May 7, 1900. At the time when Mr. Jones became the head of the company, the factory and office were at 345 South Canal street, occupying the second floor of the building. The number of employes was about eighty, and the company's annual business was over $60,000.

FRANK G. JONES.

Mr. Jones signalized his control of the company by a radical departure in its business methods. Up to 1900 the company had not spent any money for advertising, did not have any traveling men, and confined itself solely to such business as came to it without solicitation through the mail. Realizing the possibilities of the Independent telephone business, Mr. Jones began a very aggressive campaign, increasing the number of specialties manufactured by the company, purchasing new machinery and other factory equipment, carrying a large stock, advertising liberally and putting traveling representatives on the road.

In 1901 the factory of the company was moved to Adrian, Michigan, and a new Chicago office was opened at 50 West Jackson boulevard. At the same time a New York office was opened in the Morton building and placed in charge of W. B. McCurdy of the company, who still continues to be the company's eastern representative. In 1902 a southern office was opened at Atlanta, Georgia in charge of P. E. Allison, who also continues as the company's representative for the south.

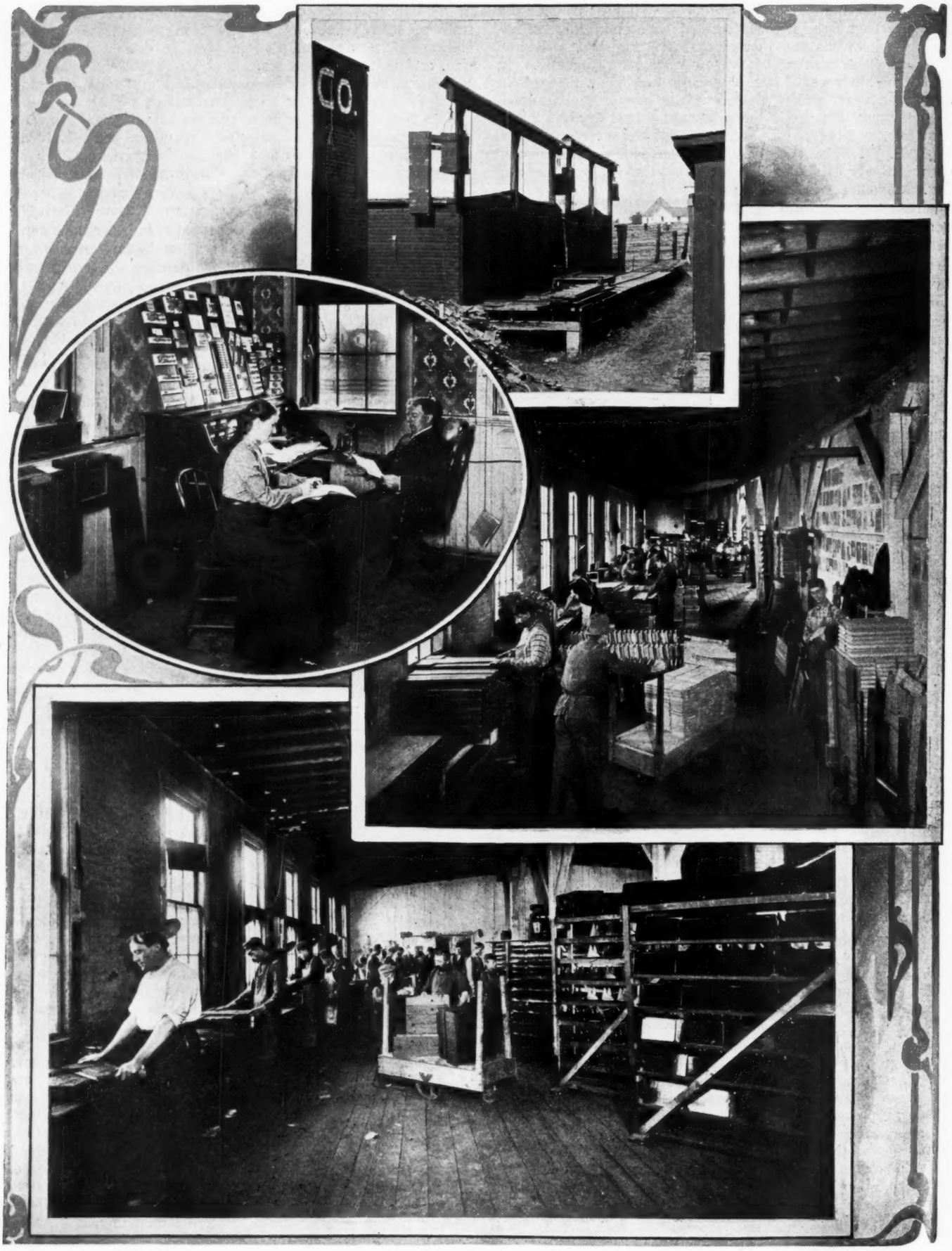
The business of the company, through Mr. Jones' progressive policy, very largely increased. The company became prosperous and broadened its field by the addition of still more specialties to its regular line. On July 1, 1904, the company's sales had been increased to over $30,000 a month, its factory employes on that date were over 350, and in its Chicago, New York and Atlanta offices a clerical staff of twenty-five people was being maintained. The Chicago office was enlarged in 1903 to double its former size, and at the present time is at 48 to 50 West Jackson boulevard, being one of the handsomest and most commodious sales offices in the telephone district.

The New York office now embraces four times its size when opened, and the Atlanta office space has been doubled. At Chicago, New York and Atlanta the company carries, at the present time, a large and well-assorted stock of all American Electric Fuse Company specialties, besides keeping a large reserve supply at its factory in Adrian, Michigan.

The history of the American Electric Fuse Company, especially since Mr. Jones became its president, is a record of continued and ever increasing prosperity; it is also a record of the hardest kind of work. Money has been spent liberally in advertising, a perfect "follow-up system" has been maintained for the securing of business, and the company has made an enviable record for itself in the eyes of the telephone trade. It is probably the fact that no company of its size in the telephone business is so broadly and favorably known or so widely advertised, as the American Electric Fuse Company. A very large part of the company's success is to be credited to the personality of the men who handle the company's business.

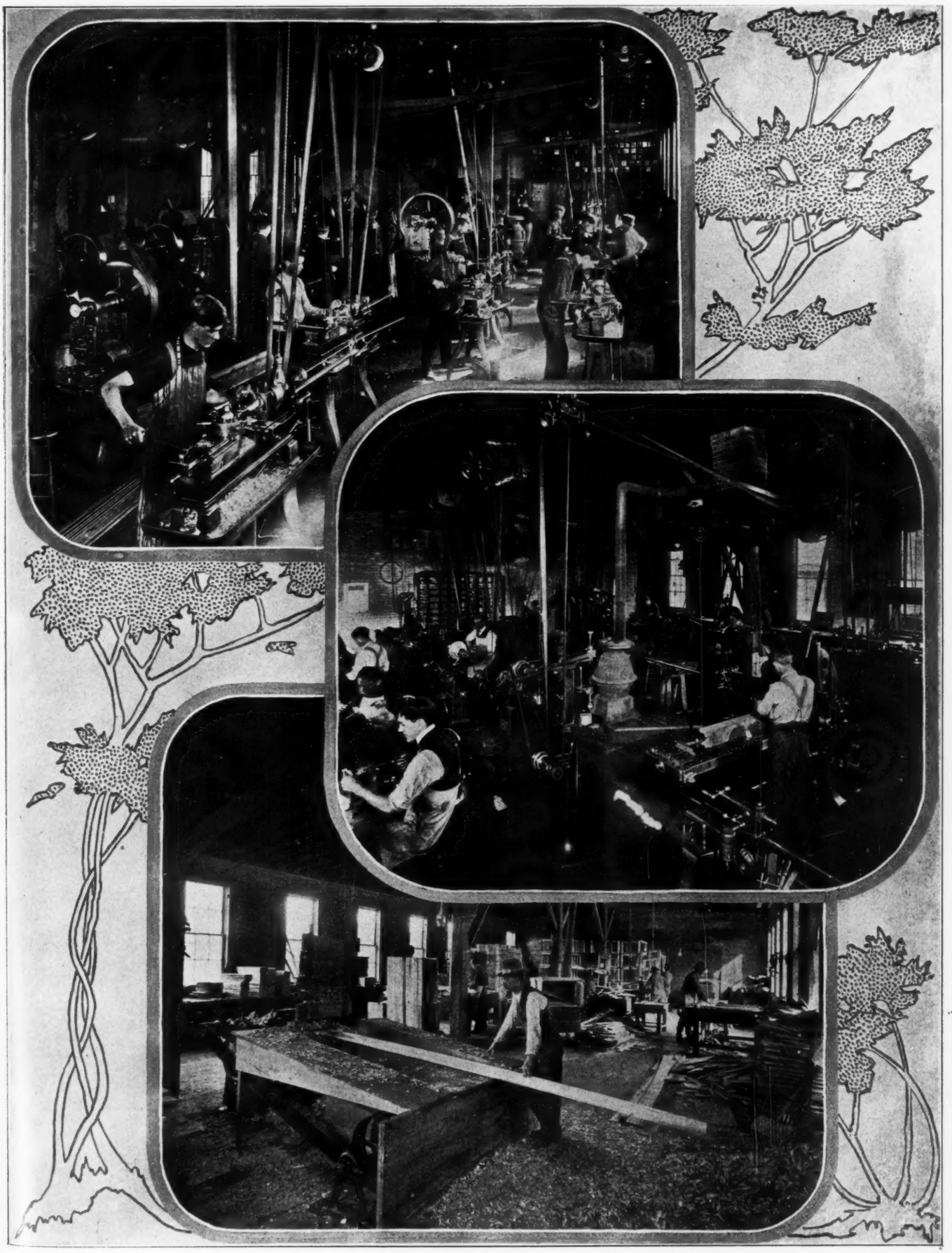
Frank G. Jones, the president of the company, is one of the best-known men in the telephone field. He is a man of untiring industry, pre-eminent business ability and unfailing resource. His hosts of friends know him also as a man whose word is as good as his bond, and who is never too busy to spare a few minutes for a friendly talk. His unfailing good nature is a byword in the telephone field. Mr. Jones, before his advent into the telephone business, was a practicing attorney, having been graduated from the law department of the University of Michigan with the degrees of LL. B. in 1893 and LL. M. in 1894. At the university Mr. Jones was elected class orator of the post-graduate class of 1894, and at the bar in Chicago maintained his reputation as a speaker of uncommon ability and force. He has made a number of addresses at Independent telephone conventions, which have earned for him a well-deserved continuation of his reputation for eloquence.

In June, 1903, Mr. Jones was elected secretary-treasurer of the Independent Telephone Association of the United



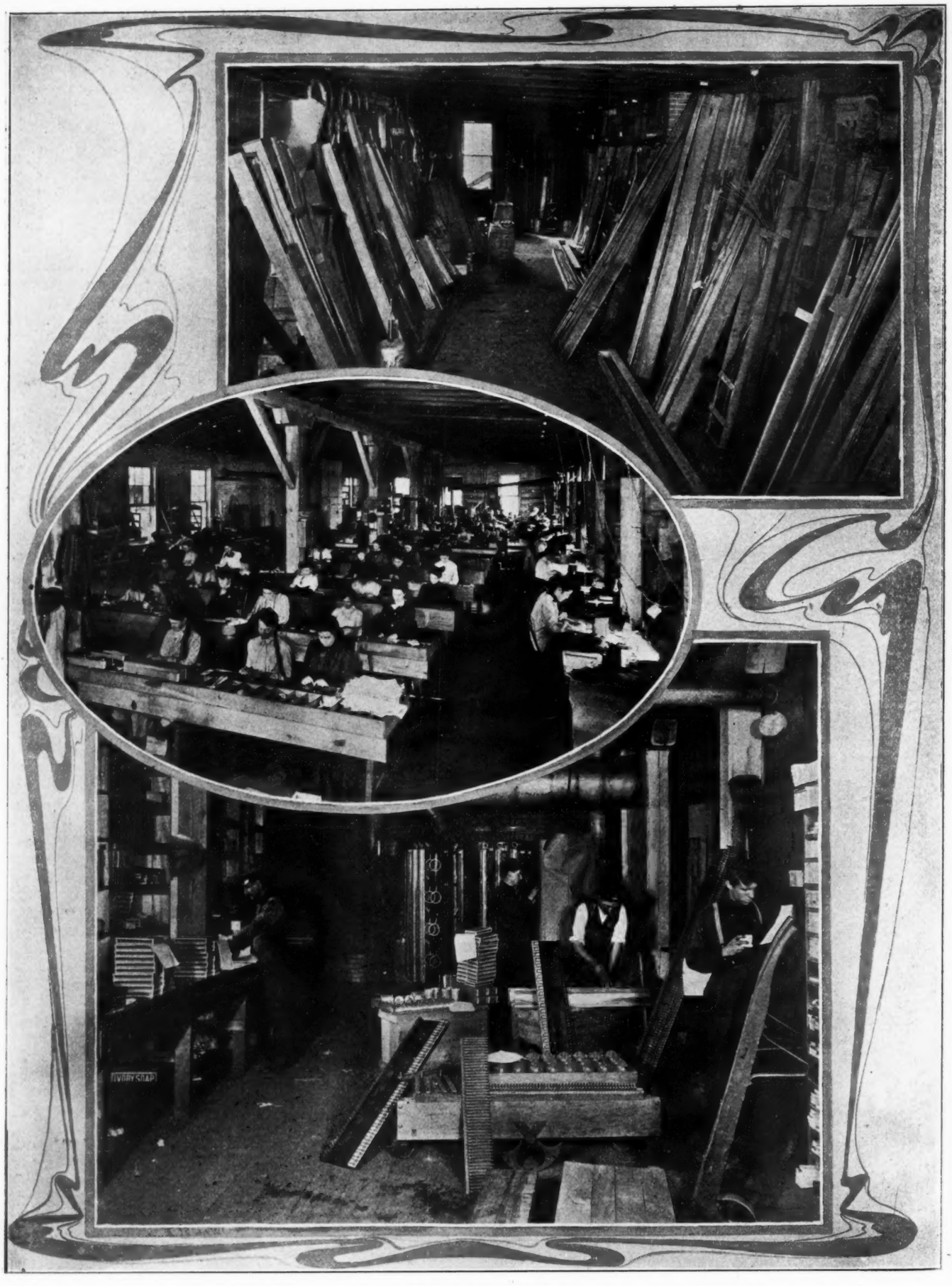
Superintendent's Office. Finishing Room. The Dry Kilns. Cabinet Room.

VIEWS IN AMERICAN ELECTRIC FUSE COMPANY'S FACTORY, ADRIAN, MICHIGAN.



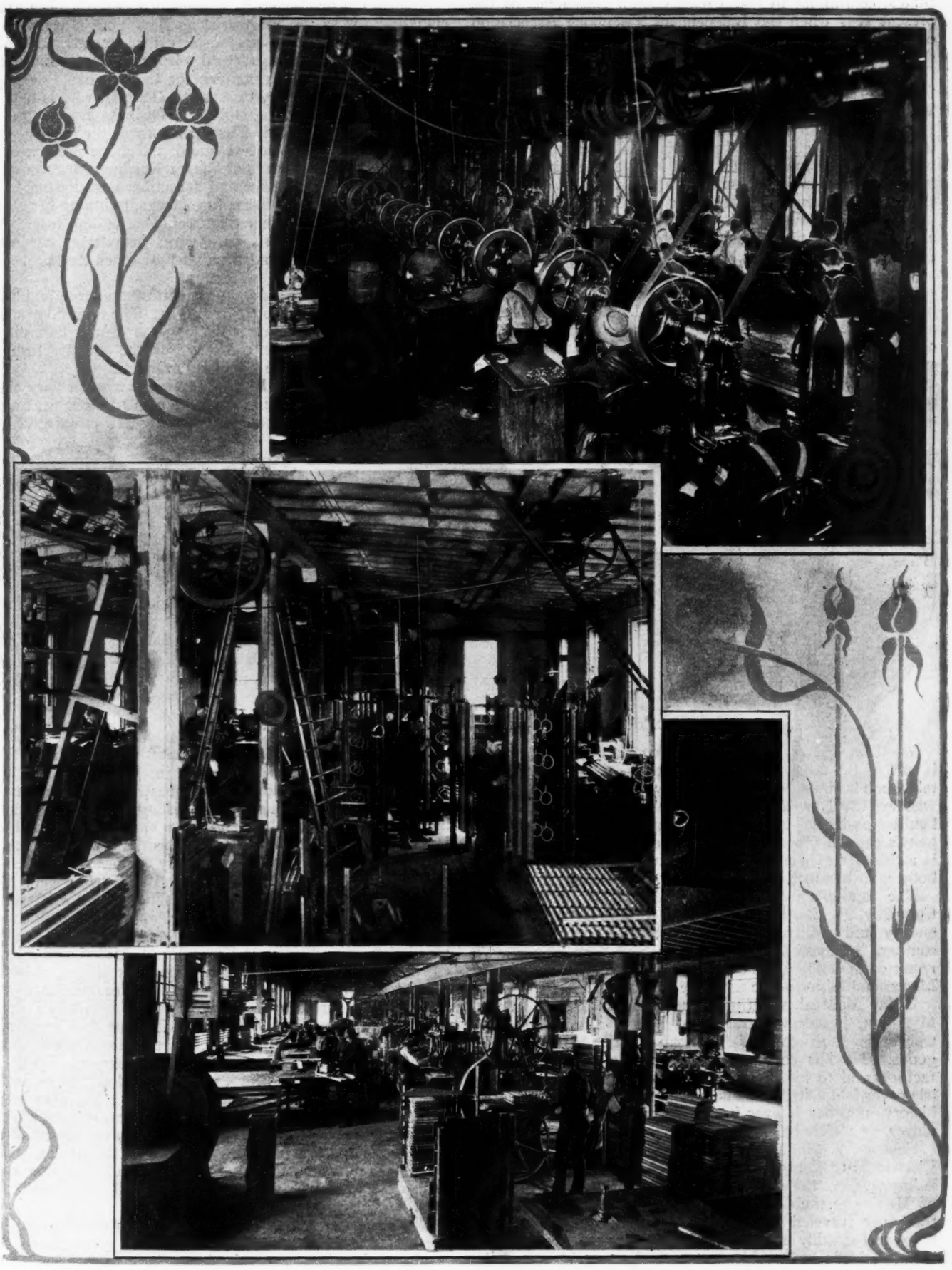
Main Machine Shop. Crating and Boxing Room. Tool Room.

VIEWS IN AMERICAN ELECTRIC FUSE COMPANY'S FACTORY, ADRIAN, MICHIGAN.



Assembling Room. Packing and Shipping Room. Heavy Stock Room.

VIEWS IN AMERICAN ELECTRIC FUSE COMPANY'S FACTORY, ADRIAN, MICHIGAN.



The Protector Room. Wood Shop. Punch Press Room.

VIEWS IN AMERICAN ELECTRIC FUSE COMPANY'S FACTORY, ADRIAN, MICHIGAN.

States, continuing in that capacity until September of the present year when the Independent Telephone Association of the United States was reorganized as the National Independent Telephone Association, at the St. Louis convention. Mr. Jones is deserving of a large share of the credit for the present reorganization of the National Independent Telephone Association; and at its enthusiastically successful convention of last month, at the World's Fair, he was untiring in his efforts to harmonize all differences, and to bring about the co-operation of all Independents in the making of a great national association. Mr. Jones' office is at the Chicago branch of the American Electric Fuse Company, 48 to 50 West Jackson boulevard, where he spends almost all of his time directing the company's business at its factory and other offices.

James A. Kenny, manager of the Chicago office of the company, is well known as one of the successful young men in the Independent telephone field. He has been manager of the American Electric Fuse Company's Chicago office for four years, during which time he has contributed greatly to the company's success and prosperity. Mr. Kenny is a practical telephone man, as well as a good business man, and has successfully devoted himself to the management of the company's western sales department.

Besides the gentlemen mentioned, the company has associated with it W. H. English at its New York office, who is assistant manager of the eastern department, and Mr. Bonney, a well-known practical telephone man, until January 1, 1904, was superintendent of the Atlanta Telegraph and Telephone Company of Atlanta, Georgia, who is now in charge of the company's mail order business in Chicago.

The American Electric Fuse Company at the present time is manufacturing a complete line of telephone protectors of all kinds, including the well-known Kaisling sneak current protector for central office and subscriber's station use, distributing frames, mica fuses, fuse blocks, lightning arresters, copper and iron wire connectors, cable heads, line fuses, pole houses, paper insulators, fuse wire, fuse links, telephone woodwork, rheostats, and a number of other electrical specialties.

The factory of the company occupies three large buildings with a factory yard of over five acres. The total floor space of the company's factory is over 75,000 square feet, all of which is being used exclusively for the manufacture of American Electric Fuse Company products.

The American Electric Fuse Company made a very elaborate and handsome exhibit at the World's Fair at St. Louis, and was rewarded by receiving the highest award given to any manufacturer of protective apparatus at the Exposition, an honor of which the company is justly proud.

J. A. KENNY.

W. B. M'CURDY.

P. E. ALLISON.

F. W. M'MEAL.

G. W. RODORMER.

W. B. McCurdy, manager of the company's eastern office, is one of the most popular young men in the Independent telephone business in New York city. He is a Chicago man who went to New York and fought his way through all difficulties and established the American Electric Fuse Company's eastern office in its present successful position. He is a member of a number of electrical societies, and everybody who has met him knows him as a hustler.

The southern manager of the American Electric Fuse Company, P. E. Allison, is a man of fine character, great energy and ability. He has built up a very successful southern business for the company, and very largely as a result of his efforts, the company is as well known south of Mason and Dixon's line as in the east and west.

F. W. McMeal, superintendent of the factory at Adrian, Michigan, is a concentration of energy and an untiring worker for the success of American Electric Fuse Company goods. He has complete charge of the company's large factory, and to his credit it can be said that the company has never had a strike or other labor disturbance in its entire history, nor has it ever had a serious accident to its employes, or suffered any damage from fire or any other cause.

George W. Rodormer, head salesman of the American Electric Fuse Company's staff of traveling representatives, is known from the Atlantic to the Pacific and from the Gulf of Mexico to the Canadian line, as one of the best fellows that ever traveled on the road. He has to his credit a large and steadily increasing volume of sales, and his number of friends among his customers is an evidence of the reason why he secures the orders that he does.

Among the many specialties manufactured by the American Electric Fuse Company its Kaisling protector, invented by William Kaisling, the well-known electrical and mechanical expert, is deserving of special mention. This protector is a self-soldering device, extremely simple in its design and construction, carefully made and said to be very efficient in service. Although the Kaisling protector has been upon the market only a short time it has already commended itself to the telephone public, and has received the commendation of such men as Kempster B. Miller, and others, as deserving what the company claims for it, that it is the best protector now being manufactured for telephone use. The Kaisling protector, according to the company's statement, also enjoys the distinction of being free from any patent complications, the patent office of the United States on August 12, in an interference case between Frank B. Cook and William Kaisling, having decided that no interference exists between Kaisling and Cook. No other interference than that with Cook was suggested, and the claims of the Kaisling patent have been allowed by the patent office, covering all of the principal features of the device. The Kaisling protector is made both for exchange and subscriber's station use, and undoubtedly will meet with continued favor in the Independent field.

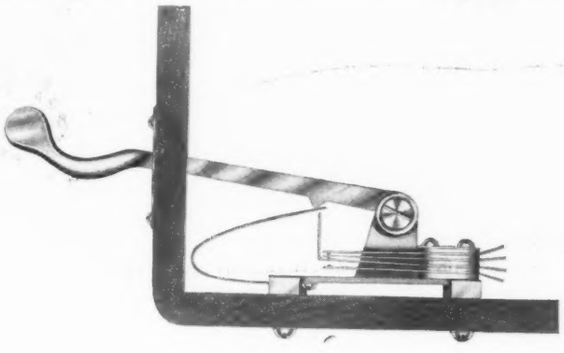
The American Electric Fuse Company's well-known line of mica fuses, fuse blocks and lightning arresters do not need any description. Probably no form of protector is so widely used as this, the company's sale of fuses alone

during the year 1903, having amounted to over 10,000,000. The American Electric Fuse Company's American wire connectors, manufactured for both copper and iron wire, is the most widely used splicing device now made. It has been adopted by practicaliy all of the leading telephone companies, and is used exclusively by most of them. During the first six months of 1904 the American Electric Fuse Company sold over 3,000,000 connectors of various sizes.

Space does not permit of the description of all the other specialties manufactured by the American Electric Fuse Company. It is sufficient to say of them that they are widely used, extremely popular in the telephone field, and that the company's sales are constantly increasing. We predict for the American Electric Fuse Company a continued success in even greater measure than it has met with in the past, and it is not improbable that it will take its place among the largest companies in the electrical trade.

NEW WILLIAMS SWITCH HOOK.

The Williams Telephone and Supply Company of Cleveland, Ohio, is manufacturing a new switchhook, which, judging from the orders they have already received for it, has scored a hit in the telephone field. This switchhook has genuine platinum contacts and is proof against grounding or short-circuiting. It has four contacts and no pivot connections, four springs being used which are readily connected to the talking and ringing circuits, and is so constructed



WILLIAMS SWITCH HOOK.

as to do away with the use of the lifting spring, the hinged joint or the frame as a part of the electric circuit, thereby eliminating all possibility of loose contacts, which in that position would be difficult to locate. The platinum points used furnish a positive electric contact in all climates and under all conditions of moisture and temperature. The springs are so adjusted that the hook is perfectly balanced. The hook is self-contained and can be taken out for any purpose without disturbing the other parts of the telephone. The lifting spring is of tempered steel, which is always uniform in its tension. No pains or expense have been spared to make this hook what it is pronounced by experts to be—*electrically perfect;* and this is entirely in keeping with the purpose of the Williams company, which aims at all times to keep its apparatus up to the highest standard of excellence.

The company has recently issued a little book on telephone line construction, which will be sent to all who may be interested in the building of rural telephone lines who ask for it.

Present indications for fall business are unusually good, and among other business this concern has just secured an order for the entire equipment of the new exchange of the Brownsville & College Corners Telephone Company at Liberty, Indiana.

The telephone makes life easier and more worth living.

OLD COMPANY IN NEW HANDS.

E. M. Snow, owner and manager of the Guarantee Telephone and Equipment Company, Chicago, is rapidly coming to the front in the Independent telephone manufacturing field. He has been actively engaged in the telephone business for a dozen years, and has invariably met with success in his operations. He now proposes to make a still further bid for Independent patronage by manufacturing a high grade of telephones and farmers' line boards at the Guarantee plant and has installed the latest machinery for that purpose.

Mr. Snow first saw the light of day at Princeton, Illinois, September 23, 1865. After receiving a common school education he moved to Kansas, in 1878, where he engaged in farming. Three years later he shook the dust of the Sunflower state off his feet and took up his residence in Albuquerque, New Mexico, where he secured employment on one of the daily papers, in a short time working up to the position of reporter, which position he held until 1885, when he

E. M. SNOW.

entered the railway mail service, serving under parts of two administrations. About this time he became interested in electrical matters and made a thorough study of the subject of electricity. Mr. Snow's first experience in the telephone field was at Albuquerque, as an operator in the first exchange built in that city.

In 1891 he "emigrated" to Chicago, where he took up telephony as a permanent business, securing a good position with the Bell company. His work extended through all of the mechanical departments, which embraced the manufacture and installation of telephones and switchboards. He entered the Independent field about five years ago and for two years was connected with the Acme Electric Company of Chicago, being in charge of their correspondence and sales department. Recently Mr. Snow purchased the Guarantee Telephone and Equipment Company, and will immediately extend the business, engaging in the manufacture of telephones and telephone apparatus on a large scale.

Of the many blessings enjoyed by the farmer of to-day the telephone is the greatest

MEASURED SERVICE METER.

Our attention was drawn, at the late St. Louis telephone convention, to a device for registering telephone calls, which was being exhibited at the Inside Inn by W. E. Metzel, president of the Measured Service Company of Chicago. The meter appears to be another decided step forward in the telephone world, and as we are desirous of posting our readers upon every improvement as it comes along, in order that they may keep abreast of the times, we have obtained the following report of the meter and the Measured Service Company. On this page will be found a picture of the meter, which is a small instrument placed at the sub-station and used for the benefit of the subscribers:

When a connection is made the calling party pulls the lever, which throws a buzz over the wire, notifying the operator that he has registered. This call is shown on the face of the meter. At the end of a certain period, when it is required to take statements, the record taker or central office machine is placed in connection with the sub-station device, the party is called and asked to turn the crank. This operation takes a statement on a tape by Morse code at the central office of the number of calls made since the last reading. If the meter will do what the company claims for it (and it is evident from the number in successful operation that it will) we believe it will go a long way toward solving the very difficult question of measured service. We see no reason why the telephone business should not follow along the lines of the gas, water and electric power business, all of which started by charging a flat rate, but eventually resorted to measured service, recognizing that the only fair way to charge is for "services actually rendered."

The Measured Service Company is an Illinois corporation, with offices and factory at 153-159 South Jefferson street, Chicago. The personnel of the directorate is a very strong one, the directors being Messrs. Scotten and Snydacker of the Harris, Scotten Company, and Messrs. Metzel, Sheppard and Edmonds of the Edmonds-Metzel Manufacturing Company. Messrs. Scotten and Snydacker are well known Chicago business men who have the reputation of never having been associated with an unsuccessful proposition. A representative of TELEPHONY called on them at their offices in the Board of Trade Building, where they occupy the entire third floor, and elicited the following statement from them:

"Yes, we are the directors of the Measured Service Company; in fact, we may say that we represent the heavy end, that is, the financial end. We don't know much about the telephone business, but we did not go into this proposition for the good of our health, or without making the most careful inquiries as to what we were doing.

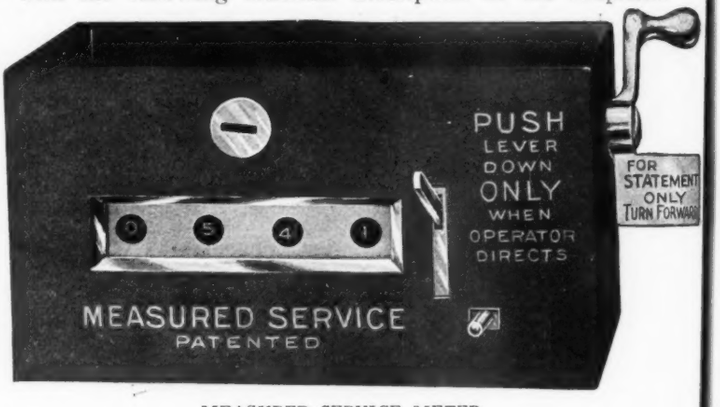
"1st. We are satisfied that the meters do what is claimed for them.

"2d. We have been assured by numerous leading lights in the telephone world that our meter will fill a long felt want; for instance, this letter is one received, amongst numerous others, but happens to be handy here—it is from a well-known telephone man whose name we do not care to mention, who says: 'Regarding your inquiry as to the value of the measured service device exhibited to us by you, will say that if this device will do all that you claim for it (and at the present moment we can see no good reason why it will not work entirely satisfactory) there is certainly a wide field for the use of a device of this character, and we believe you ought to make a great success with it.'

"3d. We know that our basic patents are secure and we do not fear any competition.

"On the whole we are satisfied that we have a winning proposition and you will probably note that we do not propose to 'run any hospital.' As far as the financial end is concerned, I guess we can look after that, while the reputation earned by the Edmonds-Metzel Manufacturing Company for excellence in manufacturing is a sufficient guaranty that our meters will be made complete and true. The services of Mr. Merckens have been secured as foreman, and we hope to benefit largely by his inventive genius, while the sales management will be in the hands of Mr. Morrell of 'little bank' fame. We believe it is only a question of time when our meters will be found attached to nearly every telephone, and we are preparing to meet a heavy demand."

TELEPHONY'S representative next visited the factory of the Edmonds-Metzel Manufacturing Company at 153-159 South Jefferson street, where the meters are being manufactured. At the present time fifty meters are being turned out complete each day, while new machinery is rapidly being installed, so that in a few months the output can be increased enormously. Over 120 hands are at present employed. A large map of the United States covered one end of the office; this was studded with little black pins, each pin indicating that an inquiry had been received from a certain city. The pins reached from San Francisco to Rhode Island, showing that the progressive telephone man is already alive to the possibilities of the meter, and anxious to take up the question of its use. Mr. Metzel supplied us with the following technical description of the telephone



MEASURED SERVICE METER.

meter as applied to existing switchboard and telephone circuits:

In applying the meter to local battery, i. e., magneto call service, the apparatus at the subscriber's station consists of the regular telephone equipment with the addition of the meter. The circuits at the sub-station are so arranged that when the telephone user draws down the call recording lever, it results in short-circuiting the line several times in quick succession, giving a buzz over the line to the operator. At the switchboard, the line circuits are not changed the slightest from existing conditions, nor are the cord circuits changed in any respect. Thus, from a limited call station line, a call to central from the subscriber would be handled in the following manner:

The subscriber turns his magneto generator and sends a calling current over the circuit, resulting in throwing the drop shutter. The operator upon observing this places a connecting plug into the spring jack corresponding to the fallen shutter, and cutting in her telephone set, makes the usual inquiry. After learning the number of the line with which the calling subscriber desires to have his credit connected, the operator will proceed to ring the called for subscriber's bell. The moment that the called for subscriber responds, and before permitting the subscribers to carry on their conversation, the operator would request the calling subscriber to pull down the reporting lever, and on his complying with this request, would result in operating the buzzer which notifies the operator, indicating that the subscriber had complied with her request.

In order to read the calls of the subscriber at the central office, a switching plug is installed with an ordinary telegraph relay in series with ten or fifteen cells of dry battery. In addition to the above, the contacts of the relay are connected to the magnet and battery of a standard telegraph register. With this apparatus, a short-circuiting of the connecting plug would result in the telegraph relay pulling up its armature and closing its local circuit, comprising, as stated before, the telegraph register, magnet and battery, and as long as the plug remained short-circuited the telegraph relay would remain drawn up and the telegraph register key would produce an imprint on the tape.

Now it will be granted that a certain number of calls have been made from a given station, and that the central office attendant desires to take a record of the calls made; he will place a connecting plug into the subscriber's spring jack, and after calling up the subscriber, request that he pull forward the record-taking crank to the right of the call box. When the subscriber complies with this request, he pulls forward the record-taking crank and causes his telephone circuit to be opened; and, furthermore, he causes a wiping contact-maker to automatically pass over the contact points of the recording cylinders. It should be understood, therefore, that when the subscriber pulls forward the crank his own circuit is opened, but that the contact-making wiper is caused to automatically travel back over the contacts on the cylinders and produce momentarily closed circuits of the line, and result in causing these momentarily closed circuits to record on the tape of the telegraph register at the central office. When the wiper has passed over the entire series of contacts then the subscriber's telephone circuit is again closed and the central office attendant observing that the record has been properly received, may dismiss the subscriber with the information that the record has been taken, and possibly, if desired, inform the subscriber of the exact number of calls recorded, and thus permit the subscriber to compare this statement with the record numbers visible to him by observing the exposed numbers upon the recording cylinders through the glass face of the meter.

The above is the method of operation, whether arranged for magneto call, centralized call or common battery. In all magneto call systems where the line circuit is clear from permanent crosses, this operation will apply. In case that the line circuit is provided with a bridging drop the telegraph relay may be adjusted so that it will not respond to a resistance equal to the bridging drop, usually 1,000 ohms, but that it will respond to the comparatively low resistance of the short-circuit at the subscriber's station, resulting in recording the short-circuit, as described above.

In case that this plan is impracticable, owing to very long lines, or extremely low resistance of the bridging drop, or other circumstances, the record-taking mechanism may work from one wire to the ground. This applies both to the central office and to the subscriber's station equipment. In common battery systems where impedance coils or relays are permanently tied to one or both sides of the line circuit and connected to the battery, the subscriber's station equipment operates practically in the same manner as that described in connection with the magneto call system. At the central office, however, the telegraph relays in the record taking call circuit are wound to suitable resistances for working in parallel; say with the tip side of the line circuit,

S. C. Scotten, Chairman Board of Directors. W. E. Metzel, President and General Manager. J. G. Snydacker, Treasurer.
H. H. Morrell, Sales Manager. John Merckens, E. E., M. E., Foreman. A. R. Sheppard, Vice-Pres. J. D. Edmonds, M. E., B. S., Superintendent.

OFFICERS AND DIRECTORS OF THE MEASURED SERVICE COMPANY.

and the relay or impedance coil that may be connected from the tip side of the line circuit to the battery. Thus it will be observed that the record-taking relay will not be energized unless the subscriber's station equipment is closed. In this system the sleeve side of the cord circuit would be connected to the battery in the usual manner for the purpose of providing a busy test for another operator who might want to use the same circuit for service.

The above plan applies to the common battery system introduced by the American Electric Telephone Company and the Sterling Electric Company. The application of the system to the Kellogg circuits requires but little modification, as it will be understood by remembering that it is only necessary to imagine that the recording relay is energized in exactly the same manner as the supervisory relay would be in the switchboard circuits where the supervisory lamp is extinguished and lighted in response to the switch at the subscriber's station being moved up or down.

Mr. Metzel was asked by TELEPHONY for the "talking points" of his meter, and we publish herewith his letter:

"I am obliged to you for the opportunity of giving you in your very excellent paper, and believe that you will help my ideas as to the advantages offered by our meter for use in drawing the attention of telephone men to a device which

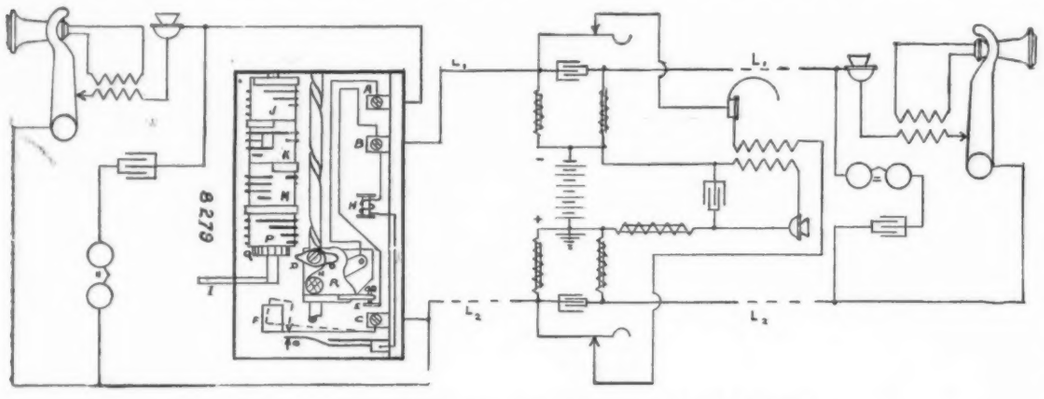


DIAGRAM OF WIRING FOR MEASURING SERVICE DEVICE.

will to some extent revolutionize the telephone business, I do not see why in the future the telephone business should not be carried on along the same lines as any other business. What would you think of a baker who charged his customers so much a year for their bread, no matter whether they used one loaf or 1,000? Probably that he was an imbecile, for not only is he making Peter pay for what Paul eats, or vice versa, but he is encouraging both Peter and Paul to waste just as much of the bread which he supplies as they desire.

"Yet this is exactly the position of the majority of the telephone companies of to-day, and certainly of all those companies which do not use measured service, but charge a flat rate only. I have recently interviewed some hundred leading telephone men and without one exception they have declared that measured service is the service of the future and that the time is ripe for changing from the flat rate system. One obstacle has always been in the way heretofore; there has been no simple method of measuring service satisfactory to both subscriber and company. Many companies use different cyclometers and counters, but these record only at one end, with the results that complaints are numerous and the impression is formed by the subscriber that he is entirely in the hands of the company. This begets a want of confidence on the part of the public and fosters a feeling of active hostility to telephone companies, which is absolutely fatal when charters or concessions are on the tapis. The meter which is being placed on the market by our company entirely overcomes this obstacle. It records at the subscriber's end and can be read at any time by central. Outgoing calls only are recorded, no attention being paid to incoming calls. There is no possibility of dispute, as the subscriber himself does the recording.

"Our first feature then is that our meter allows the subscriber to know and pay for exactly what service he receives; prevents any possibility of friction between the subscriber and the company, and will tend to decrease the use of the instrument by deadheads, who, under the flat rate system, not only lock up lines and switchboard, but also delay the service, and as long as they can secure service that way they are not going to become patrons of the system. The next strong feature is the question of credit: I remember in my school days a quotation from Demosthenes, which said, 'If you were ignorant of this, that credit is the greatest capital of all towards the acquisition of wealth, you would be utterly ignorant.' In other words, credit may justly be said to be the most powerful leverage to productive capacity. Our meter permits of credit being given to every subscriber who is worthy of it. This will undoubtedly increase the business of the bulk of the subscribers. Nothing is more galling or irritating than to have to produce a nickel, dime or token every time a subscriber wants to use the telephone. On the other hand is a subscriber is not considered worthy of credit a deposit can be asked for when the telephone is put in, returnable when the machine is taken out and as statements can be rendered monthly or quarterly, no risk of loss is incurred.

"Again our meter saves entirely the recording of calls at central. The Morse ticker can be placed in the auditor's department where statements can be taken direct; this not only saves much time to the central operator but also saves altogether the office help used for sorting tickets and compiling calls. Our meter also entirely prevents collusion between subscriber and collector. Another strong feature of our meter is that any rate can be charged for calls. Under the present system of calls there is no coin less than a nickel except a cent. With our meter any charge per call can be made. The rate can be on a graduated scale, the user of a thousand calls per month being charged proportionately less than the user of a hundred.

"I can see no reason why telephone service should not be treated as a necessity of life, instead of a luxury, or why instruments should not be placed in every house and a charge made for actual service rendered. At the present time one-half of the people in our cities never use a telephone. Why? Because they have never been educated up to it. They look upon the telephone as a luxury to be used only by the rich or in a business way. The success of the plan adopted by the Automatic Electric Telephone Company of Chicago in placing its instruments in every office in the large buildings within the loop, without asking any guaranty for the quantity of calls to be used, combined with their credit system, has sufficiently demonstrated the large number of people who are willing to use the telephone if they are provided with one without any guaranty being required. I firmly believe that when the public grasps the fact that there is a telephone meter which will enable them to pay for the service they get, and not for what the other man gets they will demand its use. And what the public demands it usually gets."

NEW COIN CONTROLLER DEVICE.

The Controller Company of America has now ready for the market a new wrinkle in the coin controller telephone idea which appears to present considerable merit. The device is shown here and consists of the Stroud Controller, which is well known as the pay-station that requires a coin or its equivalent to be deposited before the central office will answer, and returns the money to the depositor if the service called for is not obtained.

The controller is mounted upon a pressed steel base or backboard, having an extension below for an adjustable transmitter arm. The switch and coil are mounted in the base, which is of sufficient depth to contain them. A pair of extra terminals are provided beside the line posts to which to attach wires to run to a common battery extension bell, which can be placed wherever convenient, but is not intended to be used generally on the service for which

STROUD CONTROLLOPHONE.

this instrument has been designed. The intention is to use this form of telephone on party lines having as many as twenty parties, installing them without any contract or guaranty in houses where it is otherwise impossible to place a telephone. In other words, a telephone will be put in just the same as gas is furnished in cities, letting the people pay for it as they use it. The reason for making this service one-way only is well founded.

Any exchange manager who has tried measured service in a small way has ordinarily found that unless there was an agreement on the part of the subscriber to use a certain number of calls in a given time, the man who had it in his house would call up his wife from a flat rate telephone, thus ascertaining the daily needs, and save paying for the call. The grocer also would be instructed to call up and get his order, and in other ways getting around the use of outgoing service. The one-way service, which, it is understood, is intended as a means of educating people to the telephone idea, overcomes this objection at the beginning and later, when the majority of telephones are on the measured service basis, the objection would be overcome even though the bells were supplied to all these stations, because, on the measured service system, every call received is paid for at the point where it originates.

With this special one-way service the telephone is hung upon the wall, and the people use it when they want it, paying as they go, having no fixed expense to meet at the end of the month or quarter. They soon get used to the telephone and feel that it has become a necessary part of the household equipment and sooner or later apply for both-way service, agreeing to make a small guaranteed use of the service. It will be found that some use this service so much as to make it advisable to transfer them to more exclusive lines under the regular measured service without asking a guarantee, because the collections in the cash box indicate that they are using the service sufficiently to make this course advisable. This class of service pays well where business houses are in need of more than one telephone. The company can often afford to install one on chance, provided the subscriber will put the other telephone out of sight of the public and keep it for his own use. This means better service to him, and he can let the transient and dead-head service go over the pay telephone.

This form of service is also appropriate for depots and public places where incoming service is not wanted and where there is no one to properly answer calls. In one town a grocer has agreed to pay at the rate of two cents per day for each one of these telephones installed in residences for a certain period of time if the telephone company will give the people who have them one free call each day to his store to give an order for provision. His plan is to furnish special tokens which he buys from the telephone company at two cents each. He sends one of these to each of the people who have this class of telephone service with a letter inviting them to use it the first time they are in need of prompt delivery of their orders. Then with each order received from this source he encloses a token in an envelope and sends it with the order when filled. On the envelope is printed an invitation to call again. He proposes to start a special department in his business for telephone orders, and have enough trunk lines and telephone order clerks to promptly answer every call and make a special effort to take orders correctly by repeating back, the same as is done when taking telegrams by telephone. The goods will be put up out of the best stock and nothing but the best delivered on telephone orders. He proposes to purchase two small automobiles for quick deliveries and his order clerks ask each person calling if they want immediate deliveries; if so, the delivery is made within an hour from the time the order is received.

When this plan is well considered it is evident that it has the same substantial elements of business that have built up the immense enterprises of such mail order houses as that of Montgomery Ward and others applying the same conditions locally, using the telephone instead of the mail, some of the principles being to make quick sales at smaller profits, to save displaying goods, which causes loss from handling, etc.; to save the time of clerks, who often spend an hour with a customer who finally buys a bag of salt; to save extra rent for the establishment large enough to accommodate customers in the way they should be treated, and innumerable other points which need only to be understood to be appreciated.

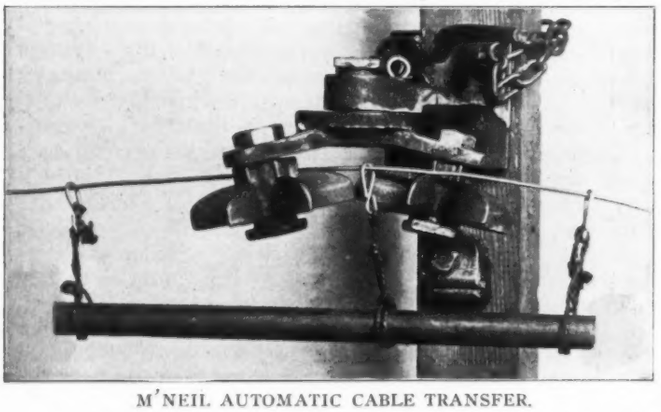
This plan in connection with the coin controller telephone means that some form of telephone service can be put in almost every house where provisions are bought, and the grocer who spends his money now in expensive displays and the other features of his business, including his present methods of advertising, can use it to pay two cents per day per telephone for having a string on the people who buy the goods.

If twenty of these instruments were put on one line with-

out any bells to be ringing and each house made one call per day the traffic would be twenty calls per day, or the equivalent of what is ten calls per day traffic on the both-way service. This is now considered good service from a traffic standpoint. If each call were paid for at the rate of two cents the earning power of these lines if used only for the purpose of ordering goods would be about $125 per year. At $10 each for the instruments the additional investment would be only about $200 per line, or, on one plan of the Controller company, where the instruments are furnished on a basis of a percentage of the earnings, subject to the telephone company's option of purchase at the end of the first or second year. In this case the immediate investment in the telephones need not be taken into consideration and the plan can be tried before any greater outlay than the installation of the instruments would be called for.

M'NEIL AUTOMATIC TRANSFER FOR AERIAL CABLE.

The McNeil Automatic Transfer for Aerial Cable is a startling innovation in the art of erecting and suspending aerial cable and will, it is claimed by the inventor, create



M'NEIL AUTOMATIC CABLE TRANSFER.

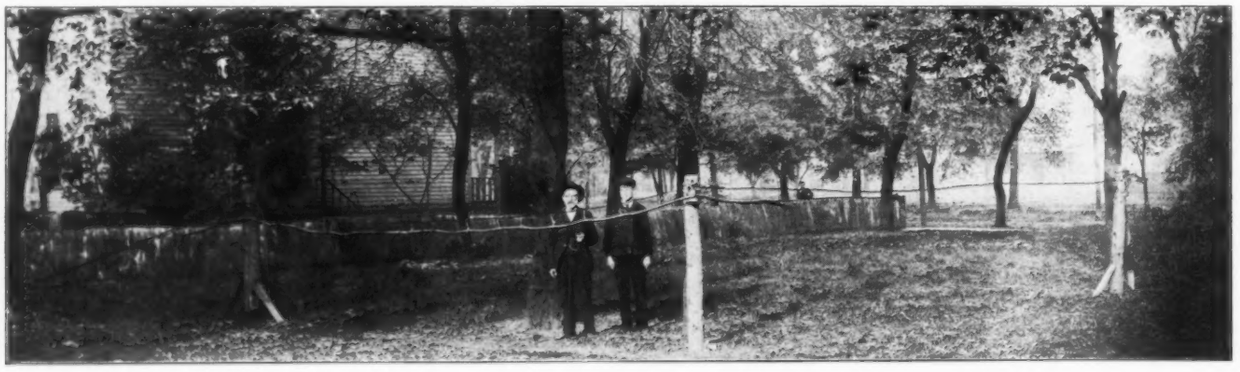
a revolution in this branch of telephone construction. An outfit for one crew of men consists of style "D," which is applied to the leader or first pole; style "C," which is applied to the corner pole at the intersection of two streets or when a horizontal angle of ninety degrees, more or less, is to be made; style "A," for general use when the poles are in fairly good alignment, and which is applicable to the majority of poles; style "B" is designed for very extreme vertical angles, seldom required.

Style "A" is well represented in the accompanying illustration; it weighs seventeen pounds and is fastened in its position by a chain which envelopes the pole, the slack being taken up by a lever of peculiar construction, especially designed for this purpose by the inventor, and as both are used it will be readily understood that it can be placed in position on the pole or removed instantaneously, which position is preferably a few inches above the permanent support (see illustration) or just high enough to allow the cable to pass this permanent support without contact. After style "A" is in position the arm supporting the wheels is moved to a right angle with the strand, then the strand is lifted from the permanent support to its bearing on the wheels, when the arm is slightly turned from a right angle just enough to conform to the general direction of the strand and locked in that position. All of this is done in less time than it takes to write this description. The strand is now ready for the operation of "pulling" the cable; the men can take their position on the ground and the automatic transfer will do the work; as the hooks or hangers slide along the strand each applies to an arm of the wheel, causing it to revolve and allowing the hanger to pass uninterruptedly toward the terminal pole. It will be noted that the *hooks are all closed* in the illustration, this can be done *before leaving the first pole;* therefore, no extension ladder work is necessary at the termination of the "pulling"; in cases where a complete outfit is used the operator closes the hooks while standing upon the ground, as the cable ascends the inclined strand from the reel to the first pole.

As above mentioned, style "A" is for general use and of itself will be a great labor saver without its companions "B," "C" and "D," as probably ten or twelve would be used of style "A," where only one or two of the other styles would be required. Take for instance a straight line of poles, as very frequently occurs, style "C" or "B" would not be required; therefore, parties who are interested enough to make a test may purchase a single one of style "A" and satisfy themselves in a few moments of its efficiency.

A general view of the McNeil test plant for erecting aerial cable is shown in the larger illustration. The automatic transfer in the foreground is style "C" at an intersection of two streets or where an angle of 90° is made. To the left is the cable ascending from reel on inclined strand to the first pole; to the right is style "A" used where the general alignment is good; style "D" is on the first pole.

In the matter of expense for an outfit for one or more crews it can be said that after operating one of these automatic transfers 100 hours its first cost is cancelled; after that time it will *be a source of revenue as a labor saver.*



GENERAL VIEW OF M'NEIL AUTOMATIC CABLE TRANSFER IN OPERATION.

These automatic transfers are equally as useful for removing aerial cable as for erecting or "pulling" new cable, all that is necessary being to reverse the order of instruction. It is well to call attention to the fact that cases are numerous where, under the present methods of "pulling" aerial cable from 1,000 to 1,500 feet of cable and strand has fallen to the ground, breaking the cable, making as many

as three splices necessary, and in addition throwing a man off the pole to the ground. The causes were as various as the number of different cases, sometimes being a single defective hanger. This never could occur with the McNeil automatic transfer, for, while the strand is not held in a rigid grip but is permitted to vibrate either horizontally or vertically to a limited degree, it cannot leave its seat on the bearings.

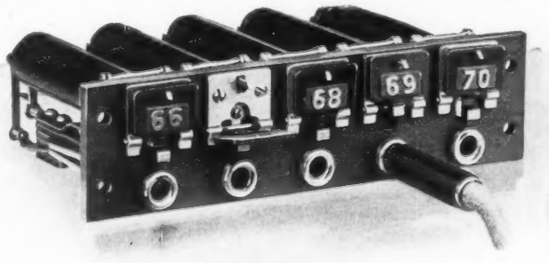
Style "A," as illustrated, is heavy enough for a fifty-pair 22-gauge cable. The chain by which it is fastened to the pole has been tested to sustaining a weight of 700 pounds, by a single suspension, while passing it around the pole increases its straining ability so that the automatic transfer when in position on the pole is as solid as a rock, affording a perfectly safe foothold for the heaviest man that climbs a pole.

Where the strand is already in position on the poles and the operator does not wish to change it, he can utilize style "A" by attaching to all except the first pole, transferring by hand by the old method, if he prefers to do this, but where the strand is not suspended until the cable is to be "pulled," it is then advisable to erect a continuous strand, anchored at the reel and the terminal pole only, utilizing style "D" on the first pole, with style "A" on all the other poles where the alignment is fairly good, and at such other points, where a considerable horizontal angle is to be encountered; then style "C" should be used, and no telephone construction plant will be complete without an outfit for at least one crew, or say for ten or twelve poles. Every telephone man who is engaged in construction work, either directly or indirectly, should communicate with the inventor, as inquiries are pouring in on him in reference to purchase of the McNeil automatic transfers, territorial rights, etc., giving evidence of a widespread interest in this matter and a disposition to get in on the ground floor.

The inventor and sole owner is L. A. McNeil, 132 South Sixth avenue, Maywood, Cook county, Illinois.

THE NEW "MONARCH" SWITCHBOARD.

Although magneto switchboards have been in use for a great many years and numberless improvements have been made since the first boards were manufactured, the subject has never been dropped and new ideas in the construction and operation of such equipment are being presented continually. Almost every little change has been a forward step, but quite a leap toward simplicity of construction was

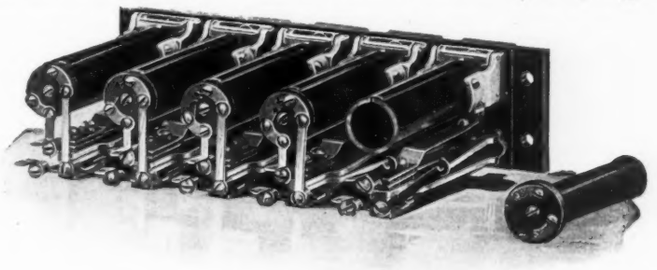


FRONT VIEW BANK OF "MONARCH" DROPS AND JACKS.

made when the Monarch Telephone Manufacturing Company of Chicago designed the self-restoring drop and jack illustrated on this page. One very noticeable characteristic of all "Monarch" apparatus is the simple ideas of construction and the ease with which any part of the whole can be removed or placed in a position for ready inspection.

Practically all telephone men agree that the removable shelf feature of the "Monarch" compact telephone is an advantage, and undoubtedly the drop construction will meet with as universal approval. What exchange man has not had trouble in removing a coil from a drop? The old method of constructing drops made it necessary to entirely spoil the adjustment of the armature whenever a coil was taken out. The new method, as shown herewith, requires no such absolute waste of time. By placing the armature on the front of the drop shell, the adjustment can be made permanent.

The coil is removed from the back of the shell and therefore does not in any way change the armature adjustment. It will be seen that connectors extend from the jack springs



REAR VIEW BANK OF "MONARCH" DROPS AND JACKS.

to the drop coil. These connectors are slotted at the upper ends so that the slots may be fitted under the screws in the head of the coil. By loosening these screws the connectors can be turned down and the coil removed. The second cut shows this feature. In the head of the coil is a pin which fits into a right angle groove in the shell so as to make a lock to securely hold the coil when in place. The coil terminals are soldered to small brass lugs into which the connector screws fit. A first-class connection is thus secured and there is no danger of breaking the fine wire which constitutes the coil winding.

Another advantage of mounting the armature in front of the coil is the increased sensitiveness. The shutter hook is short, and a smaller amount of current will operate the drop than by the use of a long hook extending from the back of the coil. The leverage is greatly reduced, and therefore less power is required. This point is especially valuable for bridging drops on long and heavily loaded lines. The armature is made of Norway iron, and is carefully annealed to obviate any trouble from residual magnetism. The coils are wound with silk-covered magnet wire to their marked resistance. As all parts are made from especially constructed tools and dies, a coil from any "Monarch" drop will exactly fit any other "Monarch" drop.

The jack construction shows a distinct departure from old ideas. The mounting for the springs is formed up from heavy brass strips, which are riveted to a brass collar on the mounting plate. An extremely rigid mounting is thus secured. Another good feature is that there is no place for dust to accumulate. A spring is provided for both tip and sleeve contacts, so the connections do not depend on the jack sleeve. Platinum contacts are used throughout, and the springs are of german silver. All insulators and bushings are hard rubber, and terminals are provided for either screw or soldered connections.

An extremely simple and positive restoring device is used. An extra spring having no electrical connections whatever with the rest of the jack is placed above the regular jack springs and is fastened by means of a rubber insulated pin to the sleeve contact spring. The end of the restoring spring extends through the mounting plate and is bent upward in the form of a right angle. A plug being inserted in a jack, the tip of the plug passes the sleeve contact spring and raises it. This action also raises the restoring spring, and the end or angle part of the spring engages the drop shutter and restores it. The springs and other parts of the jack are made of sufficiently heavy stock

to preclude any trouble from weak action. This action is just the opposite—quick and sure. The fact that the restoring spring is operated by the sleeve contact, which in turn is raised by the tip of the plug, causes the drop to be restored before the plug is more than one-third of the way in. This takes the shutter out of the way of the operator's thumb.

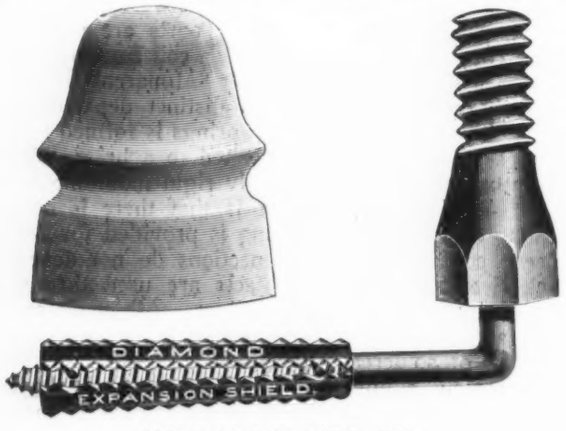
The drops and jacks are entirely insulated from each other, and also from the mounting strip. It is, therefore, impossible to get any cross-talk, and improbable that a whole strip of drops will ever be burned out by lightning. In fact, the drops and jacks are separate units mounted on 1 3/16 inches centers on steel mounting strips 1¾ inches wide by 6¾ inches long. The front of the drop and jack strip is neat and very sensible. The mounting plate is given a genuine Bauer-Barrf finish, which leaves it a dead black, which is much easier to the eye than a polished surface, and so far as lasting qualities are concerned it cannot be surpassed. The jack sleeves are nickel plated, but not polished. This makes it easier for an operator to distinguish each separate jack than by the use of glaring white jack sleeves.

The drop shutters are also given a Bauer-Barrf finish, and are equipped with raised number plates. The shutter hooks and drop faces are nickel plated, but not polished. The complete strip has a neat appearance and is every satisfying to the eye. Durability has been considered before showiness, but nevertheless a handsome effect has been produced.

Although the "Monarch" switchboard has been advertised very little up to this time, boards with an equipment of over 1,250 drops already have been sold. The Monarch company attributes this rather extraordinary success to two facts—the absolute confidence "Monarch" customers place in all products of the Monarch company, and the substantial and simple construction of the apparatus.

DIAMOND INSULATOR PIN.

The New Jersey Foundry and Machine Company, 9 Murray street, New York city, has recently placed on the market an insulator pin, as shown by the accompanying illustration, which will be of interest to telephone, telegraph, electric light, power, signal companies, and others having occasion



DIAMOND INSULATOR PIN.

to fasten insulators to brick, stone, concrete or other masonry.

The pin itself is of cast iron, with threads to fit standard glass and porcelain insulators, a bolt being cast in the base and made with a lag screw thread to fit the "Diamond" expansion shield, which will secure a positive hold in any solid material, making a simple, strong and economical fastening. The bolt can also be furnished for use with regular oak or locust pins. The shank of the belt can be furnished straight or any angle desired.

A large number of these insulator pins are being used in the subways of the Interborough Rapid Transit Company, New York, for carrying wires under station platforms.

MILLER ANCHOR WINS "WIRELESS."

No higher compliment could be paid to the Miller anchor, manufactured by the Miller Anchor Company of Norwalk, Ohio, than the fact that this anchor is being used almost exclusively by the DeForest Wireless Telegraph Company in its work. In May the DeForest company erected a 210-foot tower on Art Hill at the World's Fair grounds, St. Louis, using eight Miller anchors and eight of another make to guy the mast. The DeForest company was so well pleased with the Miller anchor that it immediately paid for the eight used and gave the Miller company an order to ship sixteen to Kansas City and sixteen to Sedalia, Missouri, for other towers. Only a few days ago another order for sixteen anchors was received, to be shipped to Jersey City for the tower there. Four more towers will be erected in the near future in connection with which Miller anchors will be used, and the stations at Key West and along the gulf coast, also those in Cuba and Porto Rico, will use Miller anchors, making an additional order for 60 of the largest size.

The Miller company states that the reason the DeForest company favors its anchor is because it has been found to be absolutely safe and more satisfactory for the purposes desired than any other on the market. As the Miller anchor is neither screwed nor driven in the ground, it is impossible for the stems to be twisted off. It was this fact, combined with the size, strength and cheapness of the anchor, that recommended it to the DeForest company, and caused it to place the orders as above stated.

"They never pull up."

INDEPENDENT TELEPHONE SYNDICATE.

The heading of this article, as given above, is the name of a new organization perfected at Chicago during the past month and which has for its object the handling of telephone securities and the promotion and financing of legitimate telephone propositions. The new firm undoubtedly should prove of great benefit to the Independent field in general, as it will provide facilities which have hitherto been lacking. Many meritorious enterprises hitherto have gone by default because of the fact that the interested parties have not known where to look for assistance in this line. One of the chief aims of the Independent Telephone Syndicate will be to afford a market for telephone securities and to present the respective merits of various telephone propositions to the investing public. They will also devote their attention to the buying, selling and exchanging of telephone properties.

The firm is composed of gentlemen of means and influence, who have a wide acquaintance throughout the field, and who are possessed of thorough experience in telephone affairs. One of the most serious handicaps of the Independent field thus far has been its lack of proper facilities for building, promoting and financing propositions of this kind. The field is one of such importance and the demand for an institution of this character has become so strong that we feel the success of the Independent Telephone Syndicate should be assured from the start. Offices have been opened on the seventh floor of the Great Northern building, in the heart of Chicago's business district, and callers will find the same in charge of J. M. Duryee, who for eighteen years was with the Prairie State Bank of Chicago. All inquiries and correspondence will be given prompt attention.

EGAN'S NEW CENTRAL ENERGY TELEPHONE.

For twenty-three years C. E. Egan of Kenosha, Wisconsin, has been before the public as a telephone engineer. He has been identified in numerous enterprises connected with the telephone industry, and is so well known in the field of telephony that, in describing his latest invention, he needs no special introduction. Mr. Egan's invention relates to telephones and telephone systems, and particularly to such as are adapted for use with so-called "common battery" or "central energy" supply. It is the object of the invention to produce an instrument and a circuit therefor which shall be simple and adaptable for use with any central office circuit, while the instrument set itself shall be very compact and the number of its parts reduced to a minimum; all this without sacrifice of commercial efficiency.

More specifically stated, Mr. Egan's object has been to construct a compact subscriber's instrument for central energy lines, in which the ringer and condenser are combined in a unitary piece of apparatus with all the other parts mounted or carried thereon. The entire set is enclosed in a very small box or casing, to reduce the cost of manufacture materially, and to render the handling and adjustment of the instrument much easier, as well as more certain, than in the prior type of instruments of this class. A further object of the invention is to obviate the necessity for an impedance coil separate from the other parts, in the transmitter circuit. This is accomplished by using a portion of the ringer winding tapped off to the transmitter branch.

In assembling and mounting the instrument, a skeleton frame comprising a yoke and a side plate is provided; the ringer cores are mounted on the yoke and the armature yoke on the cores. The switch-hook and its spring, together with the terminals of the receiver cord, with which its tips co-operate, are mounted upon the side plate; and the entire structure thus produced is mounted in the box or casing and supported from said yoke.

The invention is illustrated in the accompanying drawings, wherein Fig. 1 is a front view of the box or casing closed; Fig. 2 is a diagram of the same showing interior of telephone wired.

Mr. Egan claims that this telephone can be manufactured and sold for just one-half the cost of ordinary central energy telephones. Several of the big telephone companies of the country have tested the Egan telephone and report that it has worked perfectly, being enthusiastic in its praise.

In a folder recently issued by Mr. Egan are shown views of his telephone, with brief descriptive text. There are also printed a number of testimonials from telephone manufacturing and operating companies, which refer to the Egan telephone in flattering terms.

C. E. EGAN, THE INVENTOR.

Several telephone manufacturing concerns have made satisfactory tests of the "little telephone" and report that it will do all the inventor claims for it. A company will be organized in the near future to manufacture the Egan central energy telephone and place it on the market.

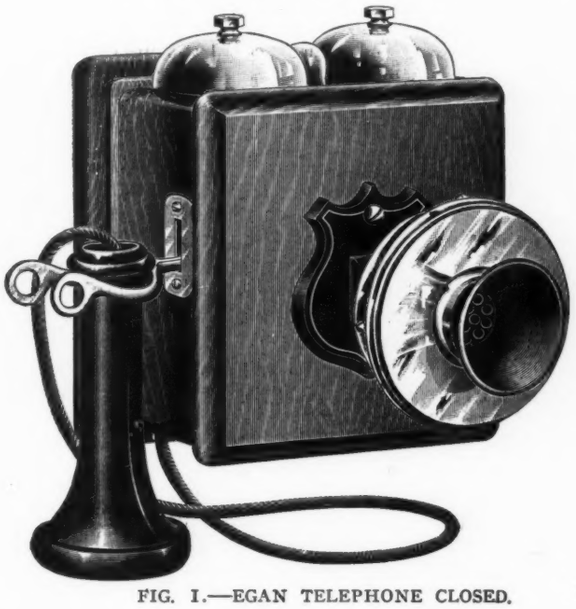


FIG. 1.—EGAN TELEPHONE CLOSED.

FIG. 2.—EGAN TELEPHONE OPEN.

JOINS INDEPENDENT ENGINEERING FIRM.

John M. Humiston, for the last eight years connected with the engineering and construction departments of the Chicago Telephone Company, has arranged to terminate that connection to enter Independent telephony. He will engage in engineering and construction work in the employ of the firm of McMeen & Miller of Chicago. This is an organization formed by Kempster B. Miller and Samuel G. McMeen. We have no hesitation in congratulating not only the firm which will now benefit by securing his services, but their clients as well. Mr. Humiston's thorough preparation and long experience have resulted in his earning recognition as a sane, careful worker in his chosen field.

JOHN M. HUMISTON.

John M. Humiston is an output of western educational institutions, having attended Lake Forest University, near Chicago, for two years, and Armour Institute of Technology, Chicago, for a similar length of time. He finished his work at the latter institution in 1896. In vacation, during his college work, he acquired practical knowledge of engineering, construction and operation in the service of the Metropolitan West Side Elevated Railway of Chicago, and of the Bankers' Electric Protective company of Chicago.

Mr. Humiston entered the employ of the Chicago Telephone Company in 1896, spending four years in the engineering department as assistant to the chief engineer. One of the most important pieces of work on which he was engaged during this engineering connection, was a complete development study which resulted in a forecast of the character and extent of future work on the particular sizes, locations and arrangements of the various central offices and their districts. The plan which is now effective, and along the lines of which the future growth of the Bell company's system in Chicago will proceed, is the plan which Mr. Humiston produced.

For several years after his immediate connection with the engineering department, Mr. Humiston was connected with the actual application of engineering to construction, being assistant superintendent of construction until January 1 of this year. At that time he took entire charge of the increase and maintenance of the outdoor plant of the Bell company in the intense downtown districts of Chicago, and of the shops in which the heavy materials, fittings and fixtures for this construction are made ready. Although it is not ordinarily apparent at first thought, the amount of additional installation and of re-arrangement and changes necessary in this congested area really makes a very large total each year, and this thorough experience in handling large things has done much to develop foresight and energy in Mr. Humiston's personal make-up.

We understand that McMeen & Miller will have entire charge as electrical engineers of the contsruction of the new Independent telephone system in Quincy, Illinois, and that they are now at work preparing specifications, plans, maps, etc., for that plant, which is to have an immediate installation of a little less than 4,000 lines. Mr. Humiston will have charge of a large part of this work. His Chicago address is that of the firm, 1442-1443 Monadnock Block.

A NEW WIRING CLEAT.

The Morris Electric Company of Wilmington, Delaware, is manufacturing a line of hard fiber cleats, which appear to be very popular with telephone construction companies. They make these cleats in several different styles and three colors, red, gray and black.

They are neat, durable, easy to install, good insulators, and, on account of the finished appearance they make, are just the thing for office or residence installations.

They were originally designed for telephone wiring only, but are now being used all over the country for bell wiring, annunciator systems, time clocks, telegraph outfits, etc., also by gasoline engine, automobile and storage battery manufacturers for fastening wires to metal or slate.

They are gradually taking the place of the clumsy wood and porcelain cleats for interior wiring. The Morris company advises us that it will cheerfully send free samples showing the different styles it makes to anyone who is interested and will write for same.

IMPORTANT DECISION REGARDING KAISLING PROTECTOR.

The United States patent office recently made a decision involving the rights and claims of William Kaisling and Frank B. Cook, relating to self-soldering heat coils. The American Electric Fuse Company of Chicago is the exclusive licensee under all the Kaisling patents, and it is the American Electric Fuse Company protector which is involved.

William Kaisling made application for a patent on what is known as the Kaisling self-soldering protector. Frank B. Cook asked that an interference be declared between Kaisling and the Cook patents. This was done by the patent office, and Kaisling moved to have the interference dissolved, the principal contention being that no interference in fact existed. After a preliminary and final hearing, in which both parties were represented by their attorneys, and after full hearing had been had of the evidence, the patent office on August 12, 1904, rendered the final decision in the following language, sustaining Kaisling's claim of no interference with Cook:

Motion was brought by Kaisling to dissolve the above entitled interference on the ground that no interference in fact exists, and because Cook has no right to make the claim forming the issue. Some time thereafter Cook filed exactly the same motion. No attention can be paid to Cook's motion for the reason that it was not filed in due time as provided by Rule 122.

It is thought that there is no intereference in fact between the two parties on the subject matter defined in the issue. Kaisling does not show any means for *restoring* the parts to normal position after the solder has been softened. In Kaisling's device the parts are set in a different position after the solder has been melted so that the fuse may be removed and turned around and inserted in such a position that it will again operate on an excess of current. The word restoring can only mean to bring the parts back to their original position. In Cook's device this is done. The interference is therefore dissolved on this ground.

The motion to dissolve on the ground that Cook has no right to make the claim of the issue is denied. The issue reads directly on Cook's device, whereas it does not read on Kaisling's device.

The limit of appeal expired on September 1, and the decision is therefore final, and bars Frank B. Cook from any future claim upon the Kaisling protector. The decision it would be noted, rests upon the ground that no interference in facts exists, this being the broadest ground upon which a patent case can be decided. The wording of the decision indicates the breadth of the Kaisling patents, and the American Electric Fuse Company states that suits will be instituted against all present and future infringers.

The Kaisling protector by the terms of the decision is absolutely free from the patent claims of Frank B. Cook or any other person. It is thus the only heat coil now being manufactured, which is not in litigation. The Cook, Sterling and Rolfe protectors are all in dispute. The Kaisling stands absolutely free from any patent claims of others.

AMERICAN ELECTRIC FUSE COMPANY.

AMERICAN BULL TONGUE ANCHOR.

In the accompanying illustrations, Fig. 1 pictures a Riehle machine used in testing a new line of anchors, known as the American Bull Tongue Anchor, which shows some wonder-

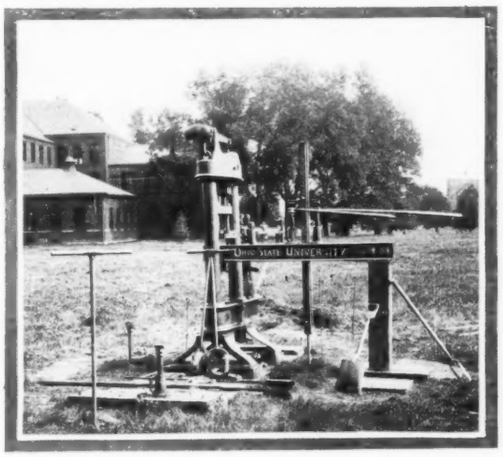


FIG. 1.

ful results. Fig. 2 shows the machine in action, and it also practically explains the method of making these tests, indicating a scale machine by which the resistance is measured on the same lines as the standard pair of scales, with the

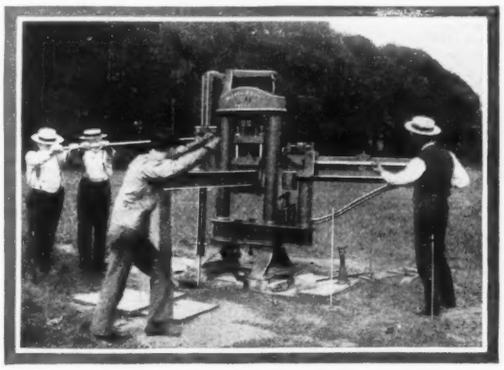


FIG. 2.

result that the tests are very accurate and must be exact to a fraction of a pound. This new anchor is in a measure getting back to the "dead man" idea, but accomplishes what the construction man has been trying to get at, and various in-

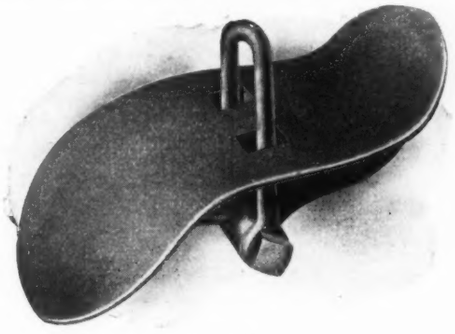


FIG. 3.

ventors have been struggling for, namely, that it is a matter of but moments to install or bury the anchor and the pulling power is practically unlimited. Fig. 3 shows the American Bull Tongue Anchor, and Fig. 4 shows the method of installing. Tests made with the anchor buried four feet underground show the following strain in pounds necessary to pull them from the ground: 3 inch, 8,713 pounds; 4 inch, 10,521 pounds; 6 inch, 16,645 pounds; 5 inch, 15,412 pounds; 7 inch, 19,380 pounds; 8 inch, 21,600 pounds; 10 inch, 33,537 pounds; 12 inch, 45,210 pounds.

These figures indicate the pulling power at four feet under earth which practically means that a four-foot crust of earth has a maximum resistance as shown above, as the anchor holds until the earth breaks, as is vouched for by the Rev. Carl Ackerman, professor of mathematics at the Ohio State University, Lima, Ohio, who superintended the installation of a 12-inch American Bull Tongue Anchor five feet in the ground, which stood a strain of 60,000 pounds without moving the anchor an inch. Arrangements were then made for increasing the strain and additional strain was then put on until the connecting rod broke and the anchor remained unmoved. Therefore, it is safe to figure that an anchor buried ten feet underground, providing the connecting rods and anchors were sufficiently strong, could not possibly be removed except by digging it up.

In the use of the American Bull Tongue Anchor, it is necessary to dig a hole six inches in diameter for a six-inch anchor, drop the anchor into the hole, pack back the earth,

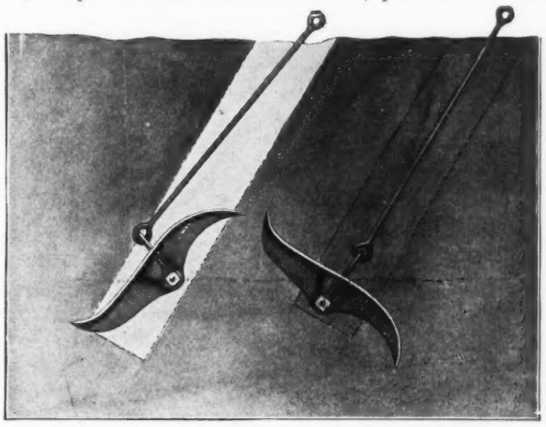


FIG. 4.

and the maximum resistance varies according to the depth buried—for a six-inch anchor, from 16,625 pounds buried in four feet of soil to 92,000 pounds buried in eight feet and one-half of soil. The entire strain on this kind of anchor is upon the solid earth and at the series of tests here mentioned there was no means readily accessible for testing the maximum resistance of the earth.

These anchors are being put upon the market by I. A. Bennett, 529-530 Monadnock building, Chicago.

FIRST PRIZE FOR PROTECTORS.

The American Electric Fuse Company, Chicago, was awarded first prize on its exhibit of protectors at the World's Fair, St. Louis. The exhibit was a very handsome one, including protectors of all types for telephone exchanges.

The jury of awards was very much impressed with the Kaisling protector at the time when the inspection of exhibits was made, and a number of the jurors expressed themselves to the effect that the Kaisling protector was the best protector they had ever seen. The American Electric Fuse Company is very proud of its record in taking the first prize, and announces that its protectors which received the highest award were taken from its regular stock, and are, therefore, precisely the same protectors as are shipped by the company to its customers.

Since the first of October, the American Electric Fuse Company has received orders for over 10,000 pairs of Kais-

ling protectors, including two orders from abroad, and the company states that the inquiries received, regarding the Kaisling protector, have averaged more than a dozen a day for the past month. Over 500 sample protectors have already been distributed, and requests have been received for as many more, which are being made up and sent out as rapidly as possible.

SUCCESSFUL FIELD MAN.

Charles E. White, who is representing Frank B. Cook of Chicago in Indiana and Eastern Illinois, has had plenty of experience in the telephone field. In September, 1882, he entered the employ of the Southern Ohio Telephone Company, then a Bell licensee, which was afterwards absorbed by the Central Union Telephone Company. He remained with the Southern Ohio people until May, 1884, at which time he accepted the position of inspector with the Bell Telephone Company of Missouri, with headquarters at St. Louis. In 1885 he was promoted to the position of manager of the central office of the Bell company, the office at that time being located at 417 Olive street. This office,

CHARLES E. WHITE.

which was destroyed by fire in October, 1885, was probably the first commercial exchange in the world. After the fire the company removed to No. 4 Pine street, where Mr. White remained as manager until 1888. He was obliged to resign this position, owing to ill health, but later went with the Central Union Telephone Company as manager of the Kankakee, Illinois, exchange, where he remained until 1891. He then became chief telephone inspector of the St. Louis fire and police telegraph department, which office he held until 1892. Owing to a change in the political administration in the city he resigned his position and decided to enter the manufacturing field. His first position in this line was with Frank B. Cook, where he was engaged in the experimental department. Here he secured much practical experience and gained a wide knowledge of the manufacturing end of the business. This knowledge stands him in good stead in the selling field and his efforts have been crowned with the most flattering success. Mr. White's varied experience enables him to talk to exchange managers from both their own and the manufacturer's point of view, and he can, when occasion demands, don jumper and overalls and dig into an awkward case of trouble. This to an exchange manager is an immediate recommendation, and Mr. White's agreeable personality does the rest.

LARGE SWITCHBOARD INSTALLATION.

The general trend of the Independent operator is to equip his exchange with central energy apparatus, particularly where an exchange reaches over 300 or 400 immediate capacity, and is expected to exceed, at some future time, 800 or 900 lines capacity. As an exception to the rule, however, the recent equipment ordered by the Independent company at Beloit, Kansas, and installed by the American Electric Telephone Company of Chicago, serves as an indication that there are still those who favor the magneto system.

A recent shipment made by the American company consisted of a 500-line Bell Express board built up in two sections of three positions each. This switchboard is provided with very complete arrangement for rendering toll service, and the trunking circuits are so arranged as to operate in conjunction with a specially equipped toll line switchboard. The magneto board is arranged for an ultimate of 1,200 lines, and each position of the switchboard may be equipped with 200 lines. The local trunking service between the operators is accomplished over the usual lamp transfer system.

HANDSOME NEW CATALOGUE.

The Chicago Telephone Supply Company of Elkhart, Indiana, has just issued one of the handsomest and most elaborate catalogues that has ever come to our notice. It is designated as No. 43 and pictures in a most attractive manner the telephones, switchboards and telephone supplies which are manufactured at its plant, as well as describing the same in detail, impressing upon the reader in a most convincing way the fact that "Chicago telephones satisfy." From a typographical standpoint the catalogue is a beauty. It is printed on heavy calendar paper, artistically bound, and the numerous superior illustrations form a feature in the general make-up that merits only words of praise. In short, it is a model of the printer's art and is truly representative of the high class of goods which come from the Chicago Supply Company. Its telephones and switchboards are known and used far and wide, and the avalanche of orders which the company is struggling with this fall is the best testimonial possible to their popularity and proof positive that the product of this concern is giving satisfaction. At the present time the factory is running night and day in order to meet the demand for "Chicago" telephones. Catalogue No. 43 should be in the hands of every prospective telephone purchaser. A written request will bring one to your desk.

EUREKA'S NEW BOOKLET.

"Independent Telephone Practice," compiled by Messrs. I. J. Kusel and A. E. Dobbs of the Eureka Electric Company, Genoa, Ill., and Chicago, has been issued in the form of a neat booklet and is now ready for distribution. It relates in the main to circuits, troubles and how to cure them, and general telephone practice, including line construction. The information contained in this little work is invaluable to the Independent exchange electrician and operator and should be in the hands of all such. While the subject matter contained has been in a measure described, there has been no similar book ever compiled that arranges this matter and data together in such a simple manner, making it so plain that it may be easily understood by the layman. It is the simplicity and instructiveness of the book that make it so valuable. The Eureka company is distributing this book, with its compliments, to any company or individual desiring a copy, upon request.

THE T. AND A. SELECTIVE CALL COMPANY, Geneseo, Illinois, has moved into much larger quarters on account of increasing business, and hopes now to be able to keep up with its orders.

THE NICHOLAS LIGHTNING ARRESTER COMPANY, Columbus, Ohio, is mailing out a pamphlet describing its patent lightning arrester and giving prices and discounts. A request will bring one.

THE COLLINS MARINE WIRELESS TELEPHONE COMPANY, New York City, has issued a price list of its apparatus. Two types of wireless telephones are included, one for interior and the other for exterior service.

THE EUREKA ELECTRIC COMPANY, Genoa, Ill., and Chicago, has just issued its new No. 33 1905 catalogue. This catalogue embraces this company's well-known and high-grade line of telephone apparatus, and will be mailed to any company desiring a copy, upon application.

THE CONTROLLER COMPANY OF AMERICA, Chicago, reports a big October business, and is running a night force at its factory to keep up with the demand for controllers. A large shipment was recently made to the Kinloch Telephone Company for use on the World's Fair grounds.

THE CENTURY TELEPHONE CONSTRUCTION COMPANY, Buffalo, New York, has received an order from the Shinglehouse Telephone Company, Shinglehouse, Pennsylvania, for construction material, switchboard and telephones for the new telephone system it is building at that place.

THE F. BISSELL COMPANY, Toledo, Ohio, has ready for distribution Bulletin No. 20, superseding Bulletin No. 20 published in June, 1903, which treats entirely of "Security" panel boards. It is illustrated and contains complete price list and description of boards. This latest bulletin will be sent to anyone on request.

HUBBARD & COMPANY, Pittsburg, manufacturers of shovels and similar tools, have entirely rebuilt and enlarged their factory, which was recently destroyed by fire, installing the finest apparatus and tools to be purchased. This company is one of the largest of its kind in existence. Catalogue and prices for the asking.

FRANK B. COOK recently received from two of the large Pacific coast companies orders for his type "M" pole top cable terminals, one of the orders being for 200. Those Pacific states people, in the matter of lightning protection, are like the bald-headed man when it comes to parting his hair—he doesn't have to. Lucky dogs!

THE FAHNESTOCK TRANSMITTER COMPANY, Brooklyn, New York, is sending out a novelty in the line of private mailing cards. On the back of the card is pictured a dry cell and to the carbon electrode is attached a sample of the spring binding post this company manufactures. This binding post possesses many features that will commend it at once to battery manufacturers and all those interested. Among these are security without the use of a screw, ability to grip any size wire, rapidity and ease in operation, simple and strong. To those interested this card will be mailed on request.

THAT spicy little house publication, *The Live Wire,* issued each month by the Wesco Supply Company, St. Louis, grows better with each issue. The October number was as bright and lively as a red-headed woodpecker and as winning as a pretty girl's smile. It abounded in good things and was a credit to the name of Wesco.

THE INTERNATIONAL TELEPHONE MANUFACTURING COMPANY, Chicago, is reaching out after foreign business, and has recently secured a large order for switchboard equipment to be used in extensions to a telephone system in San Paulo, Brazil, consisting of a 4,000-line capacity 1,500 equipped self-restoring drop switchboard.

THE HARVARD ELECTRIC COMPANY, Chicago, has just issued a new catalogue and price list—No. 14—descriptive of the extensive line of electrical goods it manufactures, and in which will be found much to interest those engaged in the telephone business. The catalogue is of the "handy pocket size," and will be mailed upon request.

THE NATIONAL BATTERY COMPANY, Buffalo, N. Y., is making ready for considerable enlargements in its equipment for the manufacture of storage batteries. The largest product of the factories is batteries for power plants and various kinds of stationary work. After these the railroad and telephone batteries are the next important.

THE MOUNTAIN STATE ELECTRICAL COMPANY, Wheeling, West Virginia, reports a constantly increasing demand for Hall cable terminals and special hardware for cable construction, and has recently booked a large number of orders, among which was one of generous proportions from the Mutual Telephone Company of Des Moines, Iowa.

THE VOUGHT-BERGER COMPANY, La Crosse, Wisconsin, claims twenty-four exclusive advantages for its Pendent telephone, which, because of its practicability and general merits, has won for itself a strong position in the telephone field. The company will be pleased to send full particulars regarding this telephone to anyone who desires it.

THE ELECTRIC CONTROLLER AND SUPPLY COMPANY, Cleveland, Ohio, announces the opening of a southern branch office at 509-510 Woodward Building, Birmingham, Ala. This company is now represented in the following cities: New York, Philadelphia, Pittsburg, Cleveland, Birmingham, Denver, San Francisco, and London, England.

THE SUMTER TELEPHONE MANUFACTURING COMPANY, Sumter, North Carolina, has a contract with the United States government to supply the army with telephones in the field. The United States army signal corps is one of the most perfect in the world and the telephone service of the government compares favorably with other parts of the service.

THE BAIRD MANUFACTURING COMPANY, Chicago, has recently received several large orders from old customers for pay-station apparatus, which proves two things—that its machines are giving complete satisfaction and are a profitable feature of their customers' business. Descriptions and prices of their entire line of pay-stations will be sent upon application.

THE EMPIRE ELECTRIC SUPPLY COMPANY, Chicago, reports a large and increasing sale of its No. 15 receiver, which is being successfully used by numerous exchanges and

toll lines. This company is also having a good demand for its No. 24 compact style bridging telephone and other telephone parts. Prices on instruments and construction material may be had upon application.

THE SWEDISH-AMERICAN TELEPHONE COMPANY, Chicago, is mailing to the trade a unique advertising conceit in the form of a burnt leather blotting pad. Swedish-American apparatus is symbolized on the leather covering of the pad by drawings of two young ladies, one attired in Swedish peasant costume, the other representing the typical American girl. The pad is an ornament to any desk.

THE T. M. PARTRIDGE LUMBER COMPANY, Minneapolis, reports that its output of white cedar poles this season will be the largest in its history. The company has got a good start in the woods this fall and already has three camps in operation, one of them working sixty men. The Partridge company will be pleased to quote prices to anyone desiring to purchase poles and invites correspondence.

JULIUS ANDRAE & SONS COMPANY, Milwaukee, Wis., have published a book for free distribution among farmers on the establishment of farm telephone systems, which explains everything in simple and plain language. The book tells exactly how to put up the telephones; explains how to maintain them; how to use them and what they cost. This book will be sent to anyone who applies for it.

FRANK B. COOK, Chicago, recently has been making several additions to his line, and is now carrying a full line of construction material, on which he is quoting some attractive prices. He is getting up a new catalogue, which will include, among other things, marlin cable hangers, anchors, messenger hangers, pole steps, insulators, cross arm braces, insulator brackets, brackets and wooden pins.

THE AMERICAN STEEL AND WIRE COMPANY, Chicago, San Francisco, New York, Denver and Worcester, has issued a price list of steel and copper wire on spools. This type of wire is made in all gauges from 16 to 36, and steel hair wire from 24 to 38 gauge. The steel wire is made up both bright and tinned annealed. The spools are of quarter, half and one-pound and one-ounce capacity.

THE MANHATTAN ELECTRICAL SUPPLY COMPANY, New York and Chicago, in a neat circular which it is sending out describes its Universal pocket battery gauge, for use in comparative tests. It is made in two styles—one for measuring one cell and the other for testing from two to five cells in series. Further particulars and prices will be furnished upon application to either the Chicago or New York offices.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, has issued a neat memorandum book on the subject of storage batteries, handsomely bound in celluloid and of such a shape as to be conveniently carried in one's coat pocket. The book includes a number of valuable tables covering a wide range of subjects, all of which are vitally important to engineers. It will be mailed to all engineers desiring a copy.

GEORGE W. CONOVER & COMPANY, Chicago, purchasing and forwarding agent for Independent telephone companies, is to the front again with something new and unique in the way of an advertising device. This time it is a pair of small red cardboard discs made to hang over the ears and on one side of which is printed the inscription "Hot air protector—all is not true that listens good." Equipped with a pair of these a man ought to be able to hear what his competitor is thinking about and defy the world, the flesh and the devil—perhaps.

FRANK B. COOK, Chicago, has recently installed for the Monroe County Telephone Company of Sparta, Wisconsin, one of his well known type "L" distributing frames, equipped with No. 44 protector. The board has a capacity of 600 pairs, and is now equipped for 300 pairs. The company expects to make additions in the near future, and it will probably not be long before the capacity of the board will have to be increased.

"THE SECRET OF OUR SUCCESS" is the title of a neat booklet by the Monarch Telephone Manufacturing Company, Chicago, and the plot of the story is summed up in this front page hint. The volume is filled with flattering testimonials from users of Monarch apparatus, interspersed with an illustrated description of the different parts that go to make up a Monarch telephone. An application is all that it takes to secure one of these booklets.

THE CHICAGO TELEPHONE SUPPLY COMPANY, Elkhart, Indiana, has made an offer to install a municipal telephone system at Brantford, Ontario, for $37,500. It is proposed to supply the present customers of the Bell company with telephones free of charge until their existing contracts expire. This well known manufacturing company has much of its apparatus installed in Canada, where it has been repeatedly proven that "Chicago telephones satisfy."

THE STANDARD VITRIFIED CONDUIT COMPANY, New York, went out of the hands of the receivers on September 10. This receivership was not on account of any financial difficulty, but was due to other troubles. The company is in a first-class condition and its business is rapidly increasing. It has on hand some very large contracts for conduit material and is operating its plant full time to keep up with the increasing demand for its material.

THE STERLING ELECTRIC COMPANY, Lafayette, Indiana, reports that the demand for its well-known type of common battery Bell type switchboards is steady and increasing. It has recently installed telephone equipment for the following companies: Johnson City Ill.; Sebewaing, Mich.; Cerro Gordo, Ill.; Portland, Ind.; Bloomington, Ind.; Winona, Minn.; Charleston, Ill.; Cheboygan, Mich.; Monmouth, Ill.; Shreveport, La.; Bay City, Mich.; Erie, Pa.

THE CALCULAGRAPH COMPANY, New York, has recently devised a form of time card for use in printing offices. This card is ruled so that in addition to the elapsed time which is shown by the operation of the instrument a record is kept as to the particular department in which the work is done. The elapsed time is figured either in hours or minutes, or in hours and decimal parts, and at a fixed rate per hour it is easy to figure the cost of each operation in the printing shop.

"BITUMINIZED FIBER CONDUIT" is the title of an artistic folder-brochure, issued by the American Conduit Company, Chicago, fully describing its well-known product—points of merit, manner of laying and other special features. It is claimed for bituminized fiber conduit that it is electrolysis and moisture proof, non-corrosive and non-abrasive. The little work is copiously illustrated and is well worth the earnest perusal of any telephone man. It's yours for the asking.

THE WILLIAMS TELEPHONE AND SUPPLY COMPANY, Cleveland, Ohio, has prepared for distribution a booklet entitled, "Telephone Line Construction and Equipment," which

contains much valuable information along telephonic lines, and should interest every telephone man, and particularly those just embarking in the business. Incidentally the Williams telephone comes in for favorable mention. If you desire the book an application by letter will bring it by return mail.

J. H. Bunnell & Company, New York city, are making a specialty of "Hylo" self-flashing lamps and the "Skeedoodle" socket plug, which will fit any Edison type socket and flashes the lamp to which it is attached about fifteen times a minute. For advertising signs, show windows and decorative purposes the "Hylo" and "Skedoodle" are unexcelled. This company handles also the entire line of Dale's designs in portable and bracket lamps. Illustrated catalogue upon request.

The exhibit of the Faller semi-automatic telephone system in St. Louis has stirred up much interest. This system has only just been completed and the demonstration made of its successful working is pronounced very satisfactory. The large savings it claims in construction and in operating are made feasible by the doing away entirely with multiples, and it gives first-class automatic service. Comparative tables, as to cost of operating, cost of construction, and number of terminals used, can be had on application to the company.

The Century Telephone Construction Company, Buffalo, New York, has begun active operations in building exchanges at Geneseo, New York, for the Geneseo Telephone Company, and at Holley, New York, for the Holley Telephone Company. The Century Company has contracted to build the entire outside wire and cable plant, and to build and furnish the central station and sub-station equipment. The switchboard will be the Century's product in the way of the common battery visual signal.

The Standard Telephone and Electric Company, Milwaukee, announces that its new desk telephone is now ready for the market and will be supplied to dealers, as well as to its regular customers. The Standard Company's battery call house telephone is also ready in two forms, with or without induction coil. The type "E" transmitter, manufactured by this company, is meeting with flattering success all over the country, and there is an unprecedented demand for "Standard" goods. The Standard Company was prominent among the manufacturing firms represented at the national convention at St. Louis.

The H. B. Camp Company, New York City, manufacturer of vitrified clay conduits for electric wires, has recently issued a handsome illustrated catalogue describing the product of its plant and setting forth the superiority of the same for use in underground construction. After an exhaustive and interesting description of Camp conduit, method of laying, etc., all embellished with numerous illustrations, is appended a partial list of prominent telephone companies using the Camp product. A specification contract form adds to the value of the booklet. It is one that should be prized by telephone men, and will be sent upon application to anyone interested.

The Monarch Telephone Manufacturing Company, Chicago, has just issued an attractive booklet, entitled, "The Secret of Our Success." It contains a number of testimonial letters received from users of Monarch apparatus, and also gives illustrations and descriptions of new features found in the telephones manufactured by this company. The title page states that the success of the Monarch company is due to an honest endeavor to make perfect telephone apparatus, to always have their equipment up-to-date and to treat their customers in a fair and square manner. Such a policy as this should bring success to anyone. A written request will bring the booklet.

The American Electric Telephone Company, Chicago, reports among recent shipments of switchboards the following equipments: Albion, Neb., 100-line switchboard; Osage, Ia., 500-line switchboard; Louisville, Neb., 100-line switchboard; Plattsburg, Mo., 100-line switchboard; Hopkins, Mo., 200-line switchboard. This company has recently supplied the United States government with switchboard exchange equipments in twelve separate divisions. Six switchboards were sent to different points in Virginia; one switchboard to Wyoming, one to New York, three switchboards to different points in California, and one switchboard to the District of Columbia.

The W. G. Nagel Electric Company, Toledo, Ohio, is enjoying a large trade in "Ready" memorandum pad holders, which are practical, neatly constructed and have sprung into great favor with the telephone using public. The Nagel company is also featuring the Polk Safety Cut-in Knob. By the use of this porcelain insulator telephone companies are not compelled to tie in their drop wires where duplex is used. It not only secures quickly, but permanently, and the wires can be run in from any direction with absolute safety. It is believed that telephone companies will find this insulator to be a time-saver as well as a money-saver. A complete line of telephone supplies is also carried by this company. Catalogues and prices on application.

The sale of Cook's No. 444 protector still goes merrily on. The principal feature of this protector is the self-soldering, self-restoring, self-contained heat coil, and it appears to be a very satisfactory feature. The Home Telephone Company of Los Angeles, Cal., has just put in a large number of pairs of the No. 444 protector—1,300 in the East exchange, 600 in the Highland avenue exchange, 1,020 in Boyle's Heights exchange, 600 in Central avenue exchange and 200 in Prospect Park exchange. The Lake Shore Telephone Company has put in 100 pairs at their Pentwater (Mich.) exchange and 140 pairs in their Hart (Mich.) exchange. The Union Telephone Company of Girard, Pennsylvania, has ordered a Cook's type "L" board with 100 pairs of No. 444 protectors. Other orders recently received are as follows: Home Telephone and Telegraph Company, Riverside, California, 1,000 pairs; Lynn Local Telephone Company, Lynn, Indiana, 260 pairs; Brooklyn Telephone Association, Brooklyn, Iowa, type "L" 3-frame board with 70 pairs mounted; People's Telephone Company, Chillicothe, Illinois, 400 pairs; Hawkeye Telephone Company, Winterset, Iowa, 360 pairs.

The American Electric Fuse Company, Chicago, has submitted the following for publication: "The Kaisling self-soldering protector, manufactured by the American Electric Fuse Company, has been adopted by the Merchants' Mutual Telephone Company of Michigan City, Indiana, for use with the new switchboard equipment to be installed by the Stromberg-Carlson Telephone Manufacturing Company. The contract calls for 800 pairs immediate installation. The Kaisling protector was selected upon its merits in competition with every other protector made. The American Electric Fuse Company especially congratulates itself upon getting this order because at the time the order was taken the customer did not have the opportunity of seeing anything more than a rough sketch and crude hand-made sample of the Kaisling protector. The Merchants' Mutual Telephone Company, in specifying the Kais-

ling, stated it did it because, in its opinion, it is the best protector made."

One evidence that manufacturers and jobbers in the electrical trade anticipate a very active business for some time to come is shown by the fact that the Central Electric Company, Chicago, one of the oldest and largest electrical houses in the business, has just increased its warehouse capacity about fifty per cent and has added very largely to its floor space. This addition has been made necessary to enable the Central Electric Company to handle its constantly increasing business and to give its patrons more efficient service. The company will carry a very much larger stock, will enlarge its shipping room to a considerable degree and will, in short, make a number of radical changes, which are bound to help it in handling its trade.

The Century Telephone Construction Company, Buffalo, N. Y., has been exceptionally busy during the past summer and its business is rapidly increasing. One of the switchboards it is building is a 1,500 line multiple common battery lamp signal switchboard in a 3,600 line cabinet, constructed on an entirely new principle, which will add greatly to the efficiency of an exchange and reduce the maintenance and amount of floor space required considerably, both of which mean an actual saving of money to exchanges using this equipment. This company has also under construction at the present time six complete common battery exchange equipments, the switchboards ranging in size from three to ten positions each. Information relating to any of its apparatus will be gladly furnished by the Century Company.

The American Electric Telephone Company, Chicago, has just received an order for the building of a combination long-distance and rural line switchboard, to be installed at Hopkinsville, Kentucky, by the Ideal Construction Company of Lima, Ohio. This order is regarded as an important one from an engineering standpoint, owing to the special requirements which it is necessary to meet. For this switchboard must be provided with means for trunking to and from both the Strowger automatic exchange and the Globe automatic exchange. At the same time, service must be given on the American company's system of selective party lines. Thus, it will be seen that the trunking and cord circuit arrangement must be such as to permit of interconnection between magneto bridging lines, party line selective, Globe automatic and Strowger automatic lines.

The Monarch Telephone Manufacturing Company, Chicago, has successfully launched its new switchboard. Orders already have been received for boards whose total equipment will amount to over 1,250 lines. The first complete board to be shipped went out October 7, to Luck, Wis. The name of this town is suggestive of success, and the board was nicknamed the "Good Luck Board." More "Good Luck" boards are now being shipped. A 200-drop equipment has just gone to the Cannon Falls Telephone Company of Cannon Falls, Minn. A 300-drop board will be shipped soon to Oskaloosa, Kan. A 100-drop board goes to Mahaska, Kan., and another to Northville, So. Dak. The Monarch company invites inquiries for prices and descriptive matters. Address Monarch Telephone Manufacturing Company, 12-16 South Clinton street, Chicago, Ill.

Quincy, Illinois, one of the towns which has so far been left without the healthy impetus of competition in telephone service, has awakened from its apathy, granted a franchise by unanimous vote of the council, and is now impatiently awaiting the benefits which uniformly follow so wise a move. Charles Wheat is general manager of the new company. The engineering of the property is now under way, Messrs. McMeen & Miller (Samuel G. McMeen and Kempster B. Miller), 1442-1443 Monadnock Block, Chicago, having been given entire charge, as the electrical engineers, of the construction of the system. We understand that during the engineering and construction this firm will maintain a branch office in Quincy, and that the work will be pushed as rapidly as possible in the hope of having several thousand subscribers connected for service in a few months.

Frank B. Cook, Chicago, submits the following for publication: ' "Frank B. Cook of Chicago, Ill., has recently had three decisions rendered in his favor by the United States Patent Office in interference case No. 23,636, Cook vs. Kaisling, relative to a self-soldering heat coil. July 25, 1904, the department denied Kaisling's motion on leave to amend his preliminary statement. August 11, 1904, the department, upon a re-hearing, again denied Kaisling's motion on leave to amend his preliminary statement. August 12, 1904, decision was rendered denying Kaisling's motion to dissolve the interference on the ground that Cook had no right to make the claim, the examiner deciding that Cook alone was entitled to the claim in interference. Limit of appeal expired September 1, and as no appeal was taken, the subject matter defined in the issue remains in Cook's application and must be erased from Kaisling's."

The Dean Electric Company, Elyria, Ohio, reports a large sale on its new Dean transmitters. This instrument is designed primarily for long-distance work and gives the best of local transmission. Several entirely new features of design have been brought out. The sound is allowed to strike the front electrode direct, without any intervening parts, thus giving the greatest possible movement and consequently the highest efficiency transmission. The well-known "damper" springs of the solid back type transmitter are replaced by a double-tongued spring, which acts directly on the central portion of the diaphragm, through the carbon retaining cup. The cup is thus forced to move with the diaphragm, and by exerting a uniform central pressure on it, effectually overcomes the lost motion due to the dead zones, which are always present in a diaphragm supporter, but not clamped at its edges. All of the parts are made self-aligning, thereby giving absolutely uniform adjustment and transmission. The mechanical details and finish are of the best. Illustrative and descriptive matter will be sent on request.

The Amsterdam Automatic Telephone Company of Amsterdam, N. Y., is completely rebuilding its systems. Some of the distinctive features are an all-cable plant, several thousand feet of underground construction, a central energy plant with modern four-party line selective instruments, and a water motor or turbine for driving a generator for lighting the building and operating the charging and ringing machines. The water supply is from the city water works, which supply comes from the Adirondack Mountains. There will be several different classes of service, such as measured service, four-party selective, and individual service. The company is erecting a new two-story building of pressed brick and stone. They expect to make the plant one of the best in the state of New York. It is designed with a special view to low maintenance and low depreciation, which means a high earning on the investment. Supervision of the construction, soliciting and operating is under the management of L. W. Stanton, consulting and construction telephone engineer of Cleveland, Ohio.

The telephone never sleeps..

Telephone Tales Tersely Told

A new automatic telephone system is being installed at Pentwater, Michigan.

F. M. Crawford of Kansas has been granted a patent on a tablet holder for a telephone.

The Boone County (Iowa) Telephone Company is planning to spend $50,000 in improvements.

The Lee County (Illinois) Telephone Company has changed its name to the Dixon Home Telephone Company.

The Century Telephone Company has been incorporated at Buffalo, New York, with a capital stock of $500,000.

Work has commenced on the improvements to the telephone exchange at New Ulm, Minnesota, to cost $15,000.

The Red River Telephone Company is extending its lines from Moorhead, Minnesota, into Clay and Cass counties.

The Topeka (Kan.) Independent Telephone Company has just issued a supplement containing the names of 500 new subscribers.

The Tiffin (Ohio) Telephone Company has installed a new switchboard of 1,200 lines installed with ultimate capacity of 3,000.

The Pioneer Telephone Company will spend $50,000 reconstructing its system in Muskogee, Oklahoma, and will begin work at once.

The new directory of the Mutual Automatic Telephone Company of Albuquerque, New Mexico, just issued, shows a big increase in subscribers.

The supplementary directory of the South Bend (Indiana) Home Telephone Company, just issued, shows 300 new subscribers in the city and county.

The Rogers Telephone Company of Chicago has been incorporated with a capital stock of $100,000 by G. L. Lavery, A. G. Welch and F. H. Sellers.

A deal has been consummated whereby the controlling interest in the Siloam Telephone Company, at Clayton, Indiana, has been conveyed to B. F. Clark of Perry Springs.

The Tri-State Telephone Company has cut long distance telephone rates at La Crosse, Wisconsin, thirty-three and a third per cent, and the Northwestern company has met the cut.

The automatic system now in use in Denver and Colorado Springs will be introduced at Cripple Creek. The improvements will cost approximately $100,000 in the Cripple Creek district.

The Sangamon Valley (Ill.) Telephone Company held a special meeting and voted to give all its business to the Interstate Telephone Company, instead of both Interstate and Bell companies.

With a capital of $100,000 the Independent telephone companies of Richland, Jasper, Crawford and Lawrence counties, Illinois, have consolidated. The combination will be run under one management.

The druggists and many other business men of Burlington, Iowa, have thrown out the Bell telephones and substituted those of the Mississippi Valley Company, the local Independent organization.

The city council of Quincy, Illinois, without a dissenting voice, has granted to the Quincy Automatic Telephone Company a twenty-five year franchise, which means that this city will have two telephone systems.

All the merchants of Owosso, Michigan, recently ordered out their Bell telephones, retaining the instruments of the local Independent company. The miserable service given by the Bell exchange was the principal cause of this action.

Canastota will have a home telephone system, a resolution having been passed unanimously by the village board to the effect that a franchise shall be granted to the Canastota Telephone Company. The exchange will be of 400 lines capacity.

W. W. Little of South Chicago, Illinois, has invented a new automatic telephone for convenience of storekeepers, hotels and other similar institutions having many departments. He has already established two systems in South Chicago.

The Independent Telephone Company of York, Nebraska, is issuing a new directory, which shows 1,400 subscribers. This is one of the largest Independent companies in the state, has one of the best equipped exchanges and gives entire satisfaction.

Nearly 1,000 people will get sixty days' free telephone service over the lines of the Sioux City Telephone Company when the telephones are put into operation January 1. Bills Brothers agree to give this service until 1,500 telephones are installed.

The value of a telephone was recently shown at Elwood, Illinois, when a straw stack on A. M. Eib's farm was discovered ablaze. In a short time Mrs. Eib had called up all the neighbors by telephone and they succeeded in saving the adjoining buildings.

The Fall River and New Bedford, Massachusetts, Automatic Telephone Companies are to be consolidated and the system extended in Taunton and Brocton. The capital of the Fall River company is $135,000 and the capital of the New Bedford company $100,000.

The Telagirl System Company has been incorporated at Cleveland, Ohio, with a capital of $25,000 to operate an exchange for public and private stenography. Edwin C. Riegel, Oscar P. Riegel, Henry Wilker, Rud. C. Frey and M. E. Meisel are the incorporators.

H. S. Wadham bids fair to revolutionize farm life in Walnut township, Kansas. He has a telephone exchange planned for the entire township and will locate his central office somewhere about the middle of the township and then trunk into the surrounding towns.

Just as soon as the connection can be made Richmond, Indiana, will be the central point between the Independent telephone system as far west as St. Louis and as far east as Pittsburg. The connection has already been made, but the switchboard remains to be installed.

The work on the Pittsburg & Wheeling Telephone line is being rushed. The general impression is that the new line is being built by the Pittsburg & Allegheny Company of Pittsburg. All rights of way have been secured between Bridgeville and Washington to Wheeling.

Col. Dickson, president of the Cuyahoga Telephone Company of Cleveland, predicts that within twelve months his company will have 20,000 telephones in Cleveland. A year ago it had a little more than 8,000, and at the present time it has nearly 14,000 telephones in use.

The contract for the exchange building of the Tri-State Telephone Company at Grand Forks, North Dakota, was awarded to Dinnie Brothers. The building will be 34x50 feet in size, one story high on high basement, and will be modern in every particular. It will cost $8,000.

The Lima (Ohio) Telephone and Telegraph Company now has about 2,000 subscribers and furnishes service to 200 outside of the city. It has an up-to-date plant and underground copper-circuit lines. The business has had a rapid and substantial growth since it was started in 1895.

The Pioneer Telephone Company of Muskogee, Indian Territory, has begun installing a new flashlight system, and the service will be extended to all parts of the city. A new brick building will be erected, and altogether $60,000 will be expended by the company in making improvements.

The Home Telephone Company of Logansport, Indiana, will give its young women operators a dance one night in every week, defraying expenses and paying wages. The company thinks that dancing will tend to allay nervousness consequent upon long hours and the irritating employment.

The plan of establishing public open air automatic telephone pay stations is about to be tried by the Cuyahoga Telephone Company of Cleveland. The apparatus will be merely a small box, about the size of a fire alarm box. The public may make use of the boxes by the deposit of a nickel.

The Citizens' Telephone Company of Grand Rapids, Michigan, is doing a good work for the people of the rural districts in its territory by co-operating with the office of the United States weather bureau in giving the people as early as possible in the day the forecast of weather conditions.

The reported sale of the Ashland (Ky.) People's Telephone Company to the Bell Company is emphatically denied by officials of the Ashland company, who further state that the company has no intention of selling out or even disposing of an interest in its business to an outside party.

B. F. Wasson of Clinton, Illinois, has made a contract with the Inter-State Telephone Company for long-distance service. The lines will be completed to St. Louis next month, and in the near future to Chicago and Peoria. The Inter-State will add 75,000 telephones to the system in Clinton.

A new device to register the number of telephone calls up to 1,000, to be used by subscribers to the limited-service telephones, has been invented by August Meyer of Baltimore. It is dial shaped and can be placed near the telephones, registering all through calls. The device is operated by a push button.

A bitter fight is being waged in Owosso, Michigan, and vicinity between the Michigan State Telephone Company and the

Union Company, with headquarters at Alma, and hundreds of miles of toll lines in the western part of the state. The Union Company has 1,000 telephones in Owosso and Corunna alone.

Secretary James B. Hoge of the United States Telephone Company is authority for the statement that Pittsburg and Kansas City will be connected by Independent lines by the first of the year. The work of stringing wires over the mountains east of Pittsburg to Philadelphia and Harrisburg is rapidly being completed.

The Citizens' Telephone Company of Mankato, Minnesota, which began business six years ago with 250 subscribers, now has 800 subscribers, 125 miles of toll lines and 125 miles of rural lines and connects with a dozen farmers' lines. The company has just completed a trunk copper line from Worthington to Twin Cities.

Fifty thousand dollars is yet to be spent at Indianapolis this season for wire in building toll lines, and $250,000 in building toll lines and local lines next spring by the Indianapolis Telephone Company and the New Long Distance Telephone Company. The company has expended nearly $100,000 this year on the local plant.

The report that the Hudson River Telephone Company (Bell) had purchased the Glen Telephone Company of Gloversville and Johnstown, New York, is denied by General Manager Hawley. An official of the Glen Telephone Company admitted that he had been approached in regard to selling, but he would not say by whom.

It comes from reliable sources that a new company has been gotten together at Augusta, Georgia, for the purpose of taking charge of the local Strowger telephone system when it is sold, and making extensive improvements. The company, it is said, will be composed of some of the leading merchants and business men of the city.

The Merchants' Association of Manhattan has inaugurated an investigation of the telephone rates in Brooklyn and New York as compared with those of other cities, with a view of getting data by which the rates in Greater New York can be reduced. It is said that an appeal will be made to the legislature to regulate telephone charges by law.

The manager of the telephone company at Turtle Creek, Pennsylvania, has scores of applications for the position of telephone operator. Miss Nana Dryburg, the operator, recently resigned to be married to Lambert Moore, head of the Westinghouse departments. Miss Dryburg is the fifth operator who has resigned during the year to be married.

When Chris Harris of Columbus, Ohio, picked up a desk telephone in his home a mysterious explosion followed and the resultant fire destroyed lace curtains and other household furnishings. A similar accident occurred at the same time in the residence of Edward Trautman, a few squares farther south. A live wire crossing with the telephone wires was the cause.

The common council of Yonkers, New York, has extended an invitation to the State Line Telephone Company to apply for a franchise in the city, provided the company will agree to give better service and at more reasonable rates than is now being given by the Bell company. The company has replied that it would be pleased to meet the members of the city council to agree upon terms.

The recorder of deeds, at Washington, D. C., according to a decision of the comptroller of the treasury, is not restricted in the amount he may pay for telephone service by the act of congress fixing the rates at $60 a year for a single-circuit telephone and $48 for two telephones on a circuit. The comptroller holds that the office is supported by fees, and its expenses are not paid by the district.

Judge Leigh Clark is attorney for two capitalists from the east who are seeking to obtain a franchise for an automatic telephone system in El Paso, Texas. They propose to give a bond of $5,000, payable to the city, if the system is not installed in the specified time and manner prescribed in the petition for franchise. The enterprise is said to be backed by plenty of money and an abundance of energy.

The rapidly increasing demand for Independent telephone service at Tiffin, Ohio, has made it necessary for the Home Telephone Company to install a new switchboard with an ultimate capacity of 2,200; number installed, 1,200. The number of new contracts awaiting service is constantly increasing. When these improvements are completed, the system will be one of the most up-to-date in the Independent field.

A contract has been agreed upon by the South Bend (Indiana) Home Telephone Company with the Long-Distance Telephone Company of Indianapaolis, which will give long-distance service to Indianapolis. Direct connection many now be secured as far south as St. Louis and Louisville. All of the points in the southern part of Indiana may also be reached. A copper metallic circuit will be provided to Logansport.

An ordinance has been introduced into the city council at Colorado Springs, Colorado, asking for a telephone franchise for twenty years for J. D. More and M. H. Spere. The ordinance provides an indemnity bond of $5,000 to protect the city from damages in the construction of the line, the free use of three telephones and an agreement that no charge shall be made to patrons until 250 telephones are installed in the city.

The Independent telephone companies of Tennessee are in a hot fight with the Cumberland Telephone Company. Recently the Cumberland made certain offers to the farmers whereby they could secure telephone service for a very low rate. The Independent companies have addressed a petition to the state railroad commission requesting it to force the Cumberland to raise these rates, else the Independents cannot conduct business at a profit.

The Jacksonville (Florida) Telephone Company, which was recently purchased by D. T. Gerow, has been reorganized by the formation of a new company, with J. C. L'Engle, Dr. W. Hume Shine and D. T. Gerow as the stockholders, incorporators, and officers of the new company. The new company proposes to take hold of the Jacksonville Telephone Company, newly equip the plant and make the necessary extensions and improvements at once.

The Citizens' Telephone Company of Newcastle, Pennsylvania, is included in a deal whereby all the telephone companies in western Pennsylvania and western New York are united under the name of the Erie Telephone Company. The consolidated companies have more than twenty exchanges. Additional long distance lines will be built. The company will wage war against the Bell company for trunk line business throughout the territory affected.

One of Missouri's rapidly growing Independent systems is the Farmers' and Merchants' Company at Moberly. The company is putting in new telephones every day, and now maintains flourishing exchanges at Stoutsville, Goss, Florida, Paris, Milton, Woodlawn, Holliday, Madison, Middle Grove, Granville, Robevena, Cairo, Ely, Woodland, Philadelphia, Endem, Emerson, Benbow, Maywood, Joanna, Perry Center, New London, Madisonville, Farber and Vandalia. R. A. Kirby is general manager.

A. J. Betchy of Woodstock, Illinois, who was going to demonstrate his method of telephoning over 800 miles of wire, has decided to postpone the demonstration until he can further perfect his apparatus. He has enlisted considerable financial backing and this interest will not agree to a public test until all details of the invention are properly protected by patents. Mr. Betchy is much elated over the success of his apparatus, and his company is preparing to make great things out of the invention.

Joseph Dalby, residing between Wheatland and Sheridan, California, is completing what is probably the longest telephone line owned and constructed by a private individual in that state. Mr. Dalby began by connecting the farm houses in his neighborhood, and his line has grown until now it has connection with Newcastle, Lincoln, Sheridan, Wheatland and Nicolaus, and will soon have connection with Marysville. When his system is completed Mr. Dalby will make Wheatland the central office.

Silence pervades the telephone situation in Omaha since the city council resolved to accept the rate reduction of $1 per month, effective January 1, on residence telephones, made by the Nebraska Telephone Company. A. B. Hunt, principal promoter of the Independent company offering the automatic telephones, says that he will cease activity toward getting a new franchise until after election, when he will take up the work again with renewed vigor and continue it until the fight is won for the Independents.

The Amsterdam (New York) Automatic Telephone Company is entirely reconstructing its system. The growing demands for extended service caused the directors to decide to install a modern system which would be able to take care of the needs of the city for a number of years to come. A complete aerial cable plant is being installed by Le Roy W. Stanton, which will have an approximate capacity for 1,200 circuits. It is estimated that the work will be completed and the exchange in operation by January 15, 1905.

The Farmers' and Merchants' Telephone Company of Flemington, New Jersey, has completed its lines to the following places: Whitehouse, Whitehouse Station, Pottersville, Mendham, Gladstone, Peapack, New Germantown, New Hope, Lambertville, Stockton, Idell, Kingwood, Sergeantsville, Ringoes, Locktown, Croton, Flemington, Rosemont, Three Bridges, Baptisttown, Frenchtown, Milford, Bloomsbury, Little York, Mt. Pleasant, Everettstown, Pattenburg, Quakertown, Pittstown, Clinton, Annandale, Lebanon and Potterstown.

After a bitterly contested fight waged for more than a year, marked by grand jury indictments, charges and counter charges of bribery, threats of libel suits and a slander suit for $25,000, afterwards dropped, the Valley Telephone and Telegraph Company of Green Bay, Wisconsin, has been granted a franchise by the common council to operate an Independent telephone system in this city. Jones & Winter of Chicago are the promoters. Local capital is largely interested. It is proposed to expend $200,000 on the new system and to commence building operations at once.

A new rural telephone line is in process of construction near Spencer, Iowa. Most of the farmers in the neighborhood readily subscribed the necessary funds, but one well-to-do, but close-fisted farmer, held out that he didn't need the new fangled device. However, a few days ago his little boy fell off a load of hay, breaking his arm, and being otherwised bruised. This accident to his child

proved a practical example to the farmer of the utility of a telephone, by which he might readily call the doctor from town. Now his appeal is urgent to have the telephone installed in his rural home.

Secretary E. B. Fisher of the Citizens' Telephone Company, of Grand Rapids, Michigan, states that the local company has not purchased the exchange of the Independent Telephone Company at Marshall, Michigan, but has acquired the controlling interest, placing that exchange in connection with the system of the Citizens' Company, which has its toll lines through that section. The Independent telephone companies, according to Mr. Fisher, are making rapid progress, the number of telephones and subscribers showing a most satisfactory increase; and even the Detroit field has been invaded.

The Western Telephone Company, recently incorporated at Lincoln, Neb., announces that it will at once build toll lines in all directions from Lincoln. It already has completed its line to Palmyra to connect with the Nebraska City lines, and is now at work on lines south to Beatrice and west to Crete and Kearney. It also intends building north to Columbus. It is offering a very liberal contract to exchange managers, modeled after the one used by the United States Telephone Company of Ohio. It is believed that all Independent telephone companies will avail themselves of the use of its long-distance lines.

The Newark (Ohio) Telephone Company has opened up its new toll line to Gratiot, which exchange already gives service to a large number of subscribers at Gratiot, Brownsville, Mount Perry, Linnville, Mount Sterling and White Cottage. All of these telephones have been installed during the past three months. These telephones are connected with the central exchange at Gratiot and are there switched onto the lines of the Newark company. With this connection the new company now gives toll service to every village and almost every crossroad in the county, and also over 1,700 telephones in Newark and Granville.

It is rumored in the west that George Gould is about to enter the Independent telephone field. It is stated that some months ago an offer was made for the purchase of the United States long-distance property, and it is supposed that this offer may have come from the Gould interests, although at the time it was thought to be backed by the Bell company. The officials of the Federal Telephone Company of Cleveland are reported to have said that no overtures have been made to that company looking to the purchase of its property. This is an old rumor in slightly altered form, and shifted from the east to the west.

The Inter-State Independent Telephone and Telegraph Company will construct a new exchange building at Peoria, Illinois, to cost $30,000. The building will be three stories in height and the telephone company will require most of the space to house its equipment properly. The basement will be used as a storeroom, to which purpose also the 71 feet in the rear of the first floor will be devoted. The second floor will contain the cable-room and power plant, the wire chief's office, in which testing machines are installed, a lunchroom for the operators, and the local offices of the company. The third floor will be entirely given over to the accommodation of a switchboard.

Every effort is being made to complete connections by means of long distance toll lines between the Independent systems of the central states at the earliest possible moment. Quite recently a long distance line was built from Richmond, Indiana, to Dayton, Ohio, and lines are now being rapidly pushed forward to connect the system in Ohio and Indiana with Kansas City and other towns in the southwest. Indianapolis and St. Louis are already connected and extensions are being built that will connect the companies in Pennsylvania, Maryland, New Jersey, and New York with the vast system of Independent lines which are rapidly forming a network over the whole country.

The Home Company of Louisville, Kentucky, now has a line in to Kansas City, which will be followed by immediate connections between Louisville and Topeka, Kansas. A line is also in process of construction between Richmond, Indiana, and Dayton, Ohio, which will give the Home Company a line into Pittsburg. With the completion of this forty miles of telephone line, which will be ready for service within a short time, the Home Company expects to be able to secure a little later on a line into Philadelphia and Baltimore. This will be accomplished by an amalgamation of interests with the United Telephone and Telegraph Company of New York state and Pennsylvania, whose lines radiate from Harrisburg, Pennsylvania.

A. B. Hunt, who, with E. E. Bruce, F. P. Kirkendall and C. L. Casey, has been trying to prevail upon the city council of Omaha, Neb., for several weeks past to grant his company a franchise, says there will be no let-up in his fight. Mr. Hunt gives as his reason for keeping up the fight that he wants the franchise and he is angry at insinuations that he has sold out to the Nebraska Telephone Company, which company has made every possible effort to prevent the council granting the franchise. Mr. Hunt proposes to circulate petitions, secure twenty per cent of the signatures of the voters of the city, which will force a special election, and he will then present an application for a franchise to the voters to say whether or not they want the system.

The Twin City Telephone Company of Benton Harbor, Michigan, and the Michigan State Telephone Company are now no longer competitors, but having reached an adjustment the St. Joseph river is now the dividing line between the two telephone systems. The fact that the Michigan Telephone Company was about to expend $75,000 for the Benton Harbor division would only have strengthened the fight that has been on for the past seven years. The Twin City Telephone Company has accordingly sold to the old Bell system everything across the river, which means not only St. Joseph, but Berrien Springs and all neighboring villages. All patrons across the river will hereafter be on the Bell system. The Twin City's line touching South Haven, Coloma and all points on this side of the river is retained.

The employes of the Pioneer Telephone exchange at Oklahoma City, Oklahoma, have filed a petition with the city council to compel the opening of a rear stairway in the building. They state that they have asked their landlord a number of times to have an obstruction removed, but that he has refused. The petition is signed by forty-five employes of the company and the officers. Three years ago the Independent telephone exchange was opened with a force of twelve employes, and it has grown so greatly that in this one building there are now forty-five employed. In addition, the general headquarters of the Pioneer Telephone Company, with its hundreds of miles of toll lines and twenty-odd exchanges, are also maintained, and all told the company pays salaries to over one hundred employes in Oklahoma City.

A telephone war is in progress at Owosso, Michigan, where the Bell company has operated very profitably until the Independent company was installed, which is also able to make a nice profit at a reasonable rate. The Independent company's patrons have increased steadily, until now the company has 950 telephones, besides a large number of rural patrons. This is considerably more than the number of telephones in use by the Bell company. Alderman Rigley introduced a resolution ordering a contract made with the Bell people and ordering out all the Independent telephones in the city offices. This is asserted to be a result of a personal grudge against Mayor Parkill, who is also president of the Independent company. Hundreds of people are displeased because of the action of the council, which appears to have passed the resolution, and it is very likely to be rescinded.

FROM RURAL EXCHANGES.

We now have direct telephone connection with Shakopee and can call up that place at any time of day or night.—*Prior Lake Items in Jordan (Minn.) Independent.*

Weldon will soon have a farmers' telephone line. A gentleman from a distance will come and work it into a reality.—*Weldon Whispers in Bloomington (Ill.) Pantagraph.*

A gang of line repairers for the telephone company came to town about a week ago. Some of them will doubtless hate to leave, as they have personal attractions here.—*Gilman (Ill.) Star.*

Miss Annie Linch is the new operator on the telephone at the central office of J. Vanantwerp. She is a fine girl and a good operator.—*Sparland Correspondence in Peoria (Ill.) Herald-Transcript.*

Our phones are in operation now and are working splendidly. No one who took a phone regrets it, while some who did not, wish they had one.—*Enterprise Etchings in Mankato (Kan.) Western Advocate.*

The Harrison Telephone Company is putting up two new lines on the Buda road and a number of the residents will soon be able to visit with their neighbors by 'phone.—*Montmorency Minutes in Sterling (Ill.) Standard.*

Wm. Giveltz, west of town, is the latest subscriber on the telephone line and will, as soon as his receiver is adjusted, add his "hello" to the neighborhood sociability.—*Stockham Splinters in Aurora (Neb.) Republican.*

The telephone line from Esbon is far south as John Brennan's. By the end of next week all the ladies in the Mt. Zion neighborhood will be able to talk with their neighbors without leaving home.—*"Tom Thumb" in Mankato (Minn.) Advocate.*

Dr. Mahaffey accepted an invitation this morning through the automatic telephone for dinner to-morrow, but finds he was mistaken in the name of the party inviting him. He says he will be sorry to miss a good dinner.—*Albuquerque (N. M.) Journal.*

Happy Jack says he is all right now as he has one of them, what you call it, O, a telephone. It is all right, too, I tell you. I can stay home when it is too bad to take the rubber tire buggy. I tell you, boys, I can talk to my girl right from my home to her home. Now don't rubber, as I don't want you to know what I say to my best girl. Ha, ha, ha! She lives out near the big dredge ditch. Ha, ha, ha!—*Holmes Hints in Paxton (Ill.) Register.*

IN THE RURAL LINE DISTRICTS

The telephone linemen are as active as squirrels.—*Cleghorn Cudgels in Eau Claire (Wis.) Leader.*

Will Wells will put in a telephone in a few days.—*Pretty Prairie Pointers in Hutchinson (Kan.) News.*

All of the telephones are knocked out so we won't do any talking to-day.—*Altona Letter in Galesburg (Ill.) Mail.*

Before many moons we can call up the hello girl. Last poles were placed Friday.—*Benson Bits in Cadillac (Mich.) Globe.*

Turner's have their telephone in now and their ring is ooxxoo. Short, short, long long, short, short.—*Trumbull Tales in Hastings (Neb.) Tribune.*

Nearly everyone here now possesses a telephone and it seems to cause a great deal of amusement.—*North Virginia Notations in Elk Point (S. D.) Courier.*

G. Schultz is having a telephone put in at his residence this week. That's right, Gus, keep up with the times.—*Volland Variations in Alma (Kan.) Enterprise.*

The telephones are in working order again and everybody is glad of it. We learn to prize a good thing when we lose it.—*Newport News in Stillwater (Minn.) Gazette.*

The new telephone line recently put in is working finely. At every tink of the bells a receiver comes down.—*Venice and New Haven Letter in Corunna (Mich.) Journal.*

The telephone line to Germantown will be completed this fall, so we can inquire about the price before we haul the wheat to town.—*Grand Plain Grist in Warren (Minn.) Register.*

Miss Mabel Lacey is the new girl at the telephone central. She has already learned to say "Number!" with the proper inflection and sweetness.—*Columbus Junction (Ia.) Gazette.*

The Rural Telephone Company of Morrill are quick to arrest but slow to fight. A lot of barking and no biting is their policy.—*Buckman Correspondence in Portland (Me.) Argus.*

Marietta now has a free rural mail route and a good telephone system, and many other modern conveniences, and is right in the push.—*Marietta Memorandums in Canton (Ill.) Register.*

The new telephone line from McAllister's store to Hawkins and Higbee's mill is about completed. Beware of the rubberneck.—*Meadow Creek Musings in Virginia City (Mont.) Madisonia.*

Little Rock is rapidly improving. It now has a central telephone office. To add interest, the boys and girls of Arrow Rock keep the bells ringing.—*Little Rock Lisps in Marshall (Mo.) Index.*

It is a little dangerous to be walking out at night in this neck o' the woods on account of the telephone holes that are dug, but no polls to place in them.—*Scoville Sendoffs in Auburn (Neb.) Post.*

Our telephone man, Mr. Windish and his family, journeyed to Pemberville Sunday and partook of a sumptuous dinner with Charles Fehr.—*Prairie Depot Doings in Bowling Green (O.) Sentinel.*

The Elm Grove hot air telephone will have quite a number of telephones on it. You can hear Jack Tooley calling hogs every morning just at daybreak and John Call quoting scripture when the old cow kicks him while milking. I tell you it will be real nice.—*Plainville (Ill.) Messenger.*

HARMONY HILL
YOU COME RIGHT HOME NOW MIRAM
I'LL GIVE $50 A YEAR
I'M FER HAVIN 'EM
IT'S MY WOMAN BEGGIN!
IT'S TELEPHONES OR BUSY
BARN THE PIGGY BANKS

Telephone is being talked on the hill again.—*Harmony Hill Happenings in Emporia (Kan.) Gazette.*

SOCK IT TO ER PETE
WANT ANY HELP PETE?
TAKES BRAINS TO DO THAT
LOOK OUT ER YOU'L FALL PETER
PETE'S A REGLER WONDER
I WOULDENT DAST DO THAT

Peter Wink was over the telephone line Saturday repairing it.—*Butler Breezes in Kearney (Neb.) Daily Hub.*

Phil Mueller, our efficient wagonmaker and telephone man, has his shop equipped with all kinds of labor-saving devices and is now prepared to turn out work on short notice.—*Stony Hill Items in Hermann (Mo.) Courier.*

E. W. Barnes came over from Dannebrog Saturday evening and remained until Monday morning. Earl was the only one of the telephone gang who came home for Sunday, but then——.—*Elba Correspondent in St. Paul (Neb.) Republican.*

Down at Casselton people take their telephone receivers down and leave them while they play the piano or banjo for the entertainment of friends, and the fad has become such a nuisance to the manager that he threatens to take out the offending phones and never put them in again.—*Lakota (N. D.) Observer.*

At last we have a telephone line in this locality and instead of feeling rather meachin when we are asked in rather contemptuous tones, "Why haven't you people a telephone?" we toss our heads and reply, "Of course we have, and our mail every day and everything up to date."—*West Twin Lake Twinkles in Rockwell City (Ia.) Advocate.*

The patrons of the county telephone would derive much more satisfaction from their telephones if some people would be a little more considerate of other's rights. There are a few as soon as they hear a "ring," ring for some one else, cutting off the first ring. Now this is not right, and unless it is stopped they will be reported to headquarters.—*Haldane Happenings in Polo (Ill.) Press.*

One of the offices in Morris has just installed a new telephone. It is a long distance concern connected with an immediate reply. A number of Morris men were called up over this line to-day and all remarked about the distinctness with which the message came. There was no "Hello! Number, please! Line's busy!" All there was to it was, "Hello! Biff!" and then the cigars.—*Morris (Ill.) Sentinel.*

The new telephones on the rural line are all right and the best we have ever used. It is a fact that you can carry on a conversation in whispers with ease and if you are dubious, as some are, try it. Mr. Geo. Basset, whose many friends know to be quite deaf, was unable to hear anything over the old telephone, but can visit with his neighbors and hear plainly on the new line.—*Fostoria Flickers in Spencer (Ia.) Herald.*

The number of telephones in the south part of town are far in excess of those in the north. What is the matter with those north of town people? Don't they want to be neighborly with the south? Put a telephone in, and every morning after the dishes are washed call up and have a pleasant chat with the south of town people. And then you won't have to waste breath by hollowing across the fence to those that live near either.—*Blackburn (Mo.) Record.*

ALABAMA.

SELMA—The Maplesville and Selma Telephone Company. Capital stock, $4,000. Incorporators, N. H. Rider, L. C. Elebash, E. E. Todd, T. M. Crumton, E. G. Ensign, W. C. Dyer, J. E. Barnes, C. E. Pornell, J. F. Gregory, T. M. Martin, J. Y. Propst.

FLORIDA.

COCOA—The Brevard County Telephone Company. Capital stock $5,000. Incorporators, H. S. Williams, Joseph Paxton, G. S. Hardee, S. S. Jones, R. N. Andrews.

ILLINOIS.

CHICAGO—The Acme Electric and Telephone Company. Capital stock $10,000. Incorporators, A. B. Schaffner, Harry Goodman and A. Kries.

CHICAGO—The Rogers Telephone Company for Illinois. Capital stock, $100,000. Incorporators: Geo. L. Lavery, Albert C. Welch, Frank H. Sellers.

INDIANA.

WOLCOTTVILLE—The People's Mutual Telephone Company. Capital stock, $2,000.

GRANTSBURG—The Temple Telephone Company. Capital stock, $5,000. President, Joseph Blevin.

GREENFIELD—The Western Grove Telephone Company. Directors, W. F. Thomas, J. C. Hamilton, L. J. Burford, Sylvester Jessup.

CHANDLER—The Chandler Telephone Company. Capital stock $2,500. Incorporators, J. W. Webb, William M. Gardiner, W. M. Cosler.

INDIANAPOLIS—The Western Grove Telephone Company of Hancock county. Capital stock, $320. Directors, W. F. Thomas, J. C. Hamilton, L. J. Burford, Sylvester Jessup.

INDIANAPOLIS—The Prairie Branch Telephone Company. Capital stock, $130. Directors, Jesse W. Beeson, Orlando Jessup, Marquis F. Jones, N. J. Suain, Harry Junisen.

WOLCOTTVILLE—The People's Mutual Telephone Company. Capital stock, $10,000. Incorporators, Daniel Strayer, Charles Kandall, A. W. Miller. The company will establish and operate a telephone system in La Grange and Noble counties, with the principal office in Wolcottville.

INDIAN TERRITORY.

MCALESTER—The Schooler Bros. Telephone Company.

WESTVILLE—K. G. Comfort and Thomas Cates of this city have bought a half interest in the Stilwell telephone system.

IOWA.

LARRABEE—The Spring Cedar Mutual Telephone Company. Capital stock $5,000. Incorporators, Richard Gilbert and others.

CHARITON—The Richard E. Pedigo Company. Capital stock $10,000. President, J. A. Pennick; secretary, Richard E. Pedigo; treasurer, W. E. Ashby.

LAWRENCEVILLE—The Starr Telephone Company. Capital stock $100,000. President, H. H. Knipe; vice-president, J. H. Senseman; secretary, G. W. Chamblin; treasurer, A. H. Calvin.

ELDORA—The Eldora, Rough Woods & Point Pleasant Telephone Company. Capital stock $10,000. President, E. H. Sheldon; vice-president, B. J. Lyman; secretary, M. D. Kennedy; treasurer, F. E. Sprain; R. J. Heath, W. H. Wehrman and F. E. Sprain, directors.

KANSAS.

WASHINGTON—The Washington Telephone Company. Capital stock, $2,500.

KENTUCKY.

WHITE PLAINS—The White Plains Telephone Company.

MAINE.

MANCHESTER—Woodland Telephone Company. Capital stock, $10,000. President, F. S. Collins, Manchester; treasurer, J. P. Collins, Manchester.

EASTBROOK—The Eastbrook Telephone Company, Ltd. Capital stock $2,000. President, S. S. DeBeck, Franklin, Mass.; treasurer, R. B. Laurie, Eastbrook, Me.

RAYMOND—The Raymond & Webb Mills Telephone Company. Capital stock, $10,000. President, F. W. Plummer, Raymond; treasurer, G. H. Hall, East Raymond; directors, F. W. Plummer, G. H. Hall, I. D. Jordan, E. M. Mason and L. N. Jordan.

MARYLAND.

ORIOLE—The Manokin Telephone Company. Capital stock, $5,000. Incorporators, A. B. Fitzgerald, R. R. Hoyt, G. W. Bowman and others.

MICHIGAN.

STERLING—The Aranac Telephone Company. Capital stock, $6,000.

MINNESOTA.

NEW MARKET—The Star Telephone Company. Capital stock $10,000.

ZUMBRO FALLS—The Zumbro Falls Farmers' Telephone Company has been incorporated with a capital stock of $7,000. Incorporators, Frank Robertson, Bert W. Disney, Chas. Anding, Albert Sugg, Albert Roberson, John C. Brinkman, Jas. Ross, Jacob J. Springer.

MISSISSIPPI.

PURVIS—The Purvis Light and Power Company, organized. President, W. H. Magee; vice-president and general manager, J. W. Woodward; secretary and treasurer, C. V. Hathorne.

MISSOURI.

SPRING CREEK—The Spring Creek Telephone Company. Capital stock $500.

NEOSHO—Granby and Neosho Telephone Company. Capital stock $3,000. Incorporators, Edward Haas, R. E. Willand, J. H. Hughes and others.

KANSAS CITY—Kansas Telephone Construction Company. Capital stock $75,000. Incorporators, James S. Brailey, Jr., Toledo, Ohio; Edward L. Barber, Wauseon, Ohio; O. C. Snyder, W. C. Polk and Hugh C. Ward.

MONTANA.

WHITEFISH—The Whitefish Co-operative Association. Capital stock $25,000. Directors, Charles Vandyke, Ed Riley, Silas Shutt, Thomas Lonney, Peter Carroll, all of Whitefish.

NEBRASKA.

YORK—The Central Nebraska Toll Line Company. Capital stock $100,000. Incorporators, J. N. Bell, Commodore N. Beaver, Herman Behling, H. M. Childs, Geo. H. Holdeman, W. E. Bell, C. H. Colling.

NEW JERSEY.

JERSEY CITY—Telephone and Telegraph Company of New Jersey, 8 Erie street. Capital stock, $250,000. Incorporators, Alfred E. Holcomb, Harry H. Brigham, George R. Minster, Samuel E. Moore, Robert Bain.

TRENTON—The Telephone and Telegraph Company of New Jersey. Capital stock, $250,000. Incorporators, Alfred E. Holcomb, H. W. Brigham, G. H. Minster, Samuel S. Moore and Robert Bain. The principal office is in Jersey City.

NEW YORK.

HAMBURG—The Boston Valley Telephone Company. Capital stock $2,000.

MADRID—The Madrid Telephone Company. Capital stock, $10,000. Incorporators, E. M. Atkins, Lisbon, N. Y.; G. P. Hosford, F. T. Rutherford, Madrid, N. Y.

PATCHIN—Boston Valley Telephone Company. Capital stock, $2,000. Incorporators, L. G. R. Whiting, John W. Gasper, Patchin, N. Y.; F. A. Wurtz, Boston, N. Y.

SMITHBORO—The Ross Hill-Smithboro Telephone Company, or-

ganized. President, Charles Carpenter; vice-president, E. E. Bailey; secretary, E. A. Hussong; treasurer, Chas. Bedell.

NEW YORK CITY—The Edmonstone Company has been organized here, to manufacture telephones, etc. Capital stock, $100,000. Incorporators, B. Thompson, D. M. Miers, J. E. Ruston, New York city.

NEW YORK—The Pinar Del Rio Railroad and Iron Company. Capital stock $1,000,000. Incorporators, Joseph Bailey, Patchogue, N. Y.; Leonard L. Bishop, West Hampden; Fred D. Gillin, Chicago, and Louis C. Cone of Havana, Cuba.

NORTH CAROLINA.

KERNERSVILLE—The Kernersville Telephone Company. Capital stock $5,000. Incorporators, W. C. Linville, G. V. Fulp, M. V. Fulp and A. N. Linville and F. W. Lubert of Waterbury, Conn.

OHIO.

CLEVELAND—The Telagirl System. Capital stock, $25,000. Incorporators, Edwin C. Riegel, Oscar P. Riegel, Henry Wilker, R. C. Frey and M. E. Meisel.

NORWALK—The Oil Belt Telephone Company. Capital stock, $25,000. Incorporators, H. E. Graham, C. M. Graham, E. N. Graham, Adelbert Graham, J. H. McNight.

CLEVELAND—The Ottumwa Telephone and Electric Company Capital stock, $150,000. Incorporators, J. A. Smith, E. A. Williams, Charles K. Carter, Fred L. Taft, G. M. Wagner.

BOTKINS—The Botkins Telephone Company. Capital stock, $20,000. Incorporators, S. H. Mendenhall, Charles Elsley, T. Baughman, Mrs. Capitol Mendenhall and Josephine Miller.

OKLAHOMA.

RINGWOOD—The Star Telephone Company. Capital stock, $1,000. Incorporators, W. L. Miller, J. S. Huffman, both of Meno, Okla.

MEDFORD—Medford Rural Telephone Company. Capital stock, $3,000. Incorporators, D. L. Cline, J. Sharp, W. S. Long, Medford.

OREGON.

WILLAMETTE—The West Oregon Telephone Company. Capital stock $2,000. Incorporators, Charles Baker, G. P. Gross, E. S. Kruse.

PENNSYLVANIA.

DUSHORE—The Sullivan County Telephone Company. Capital stock, $5,000.

SOUTH CAROLINA.

GRANITEVILLE—The Graniteville Telephone Company. Capital stock, $3,500. Incorporators, W. A. Giles, T. H. Rennie and G. L. Knight.

ORANGEBURG—The Orangeburg and Raymond Telephone Company. Capital stock, $10,000. Incorporators, E. L. Culler, J. G. Smith, W. W. Culler, Jr.

WALTERBORO—The Colleton County Telephone Company. Capital stock $5,000. Incorporators: T. B. Whatley, Gillisonville; W. F. Gray, Grays; C. C. Tracy, Walterboro.

TEXAS.

JACKSONVILLE—The Jacksonville Telephone Company. Capital stock, $15,000. Incorporators, W. H. Sory, W. P. Sory, Jr., and M. L. Sory, all of Jacksonville.

LONGVIEW—The Lacey Telephone Company. Capital stock, $35,000. Incorporators, J. G. Lacey, Edwin Lacey and J. W. Yates of Longview; Jasper Collins of Carthage.

WASHINGTON.

SEATTLE—The distribution of music in the same way that electricity is now delivered in private houses is the object of the Pacific Telharmonic Company, which has been organized at Seattle. The company claims to have the exclusive control west of the Rocky Mountains of a device which will generate and distribute music by electricity through the medium of an ordinary telephone circuit. The officers of the company are: President, C. J. Smith; vice-president, John H. McGraw; treasurer, J. W. Clise; secretary, F. A. Wing; general manager, T. O. Abbott; trustees, A. S. Kerry, Robert T. Reid.

WISCONSIN.

PEWAUKEE—The Pewaukee and Sussex Telephone Company. Capital stock $25,000. Incorporators, A. T. Larson, S. E. McDowell and William Parker.

RILEY—The Pine Bluff Telephone Company. Capital stock, $10,000. Incorporators, John Brown, John Birrenkett, Joseph F. Faust and Adolph Birrenkett.

ANNUAL MEETINGS.

INDIANA.

IDAVILLE—The Idaville Co-Operative Telephone Company has elected the following officers: President, W. Pearson; vice-president, T. B. Grime; treasurer, J. Raff; secretary, L. Read; manager, F. Roger.

KANSAS.

FULTON—The Osage Valley Telephone Company has elected the following officers for the ensuing year: President, A. J. Ball; vice-president, E. T. Shaffer; secretary, Frank H. Niles; treasurer, L. M. Byington.

KENTUCKY.

COVINGTON—The Covington Home Telephone Company has elected the following officers: President, A. S. Rosenberger; vice-president, S. W. Ullery; secretary, L. E. Simes; treasurer, G. E. Falkner.

MICHIGAN.

IRON MOUNTAIN—The Menominee Range Telephone Company has elected the following officers: President, E. F. Brown; vice-president, Samuel Perkins; secretary, Richard O. Browning; treasurer, William Sundstrom; general manager, E. O. Croll.

MUSKEGON—The Muskegon Citizens' Telephone Company has elected the following officers for the ensuing year: President, Thomas Hume; vice-president, Dr. B. D. King; treasurer, L. B. Smith; secretary, W. H. Mann; manager, William Robinson; directors, Thomas Hume, Thomas Munroe, Dr. D. B. King, J. G. Emery, Jr., C. H. Hills, L. B. Smith and E. B. Fisher.

ORD—The Davis Creek Telephone Company has elected the following officers: President, Ed Houtby; secretary, John Palser; treasurer, Milt Furnest.

GRAND RAPIDS—The Citizens' Telephone Company has elected the following officers for the ensuing year: President, Charles F. Rood; vice-president, Edward Fitzgerald; secretary, E. B. Fisher; treasurer, William J. Stuart; directors, Philip Graham, Robert D. Graham, C. E. Perkins, L. J. Rindge, E. G. Studley, G. B. Ware, Gaius W. Perkins.

JACKSON—The Citizens' Telephone Company has elected the following directors for the ensuing year: J. C. Richardson, Z. C. Eldred, T. E. Barkworth, George W. Carter, W. H. Maloney and E. W. Barber of Jackson, J. B. Ware, W. J. Stuart, R. D. Graham, C. E. Tarte and E. E. Fisher of Grand Rapids and T. Bromley, Jr., of Muncie, Ind. President, J. C. Richardson; vice-president, E. W. Barber; secretary and treasurer, E. B. Fisher.

SOUTH LYON—The South Lyon Telephone Company has elected the following officers for the ensuing year: President, Kingsley Calkins; vice-president, D. A. Killins; secretary, M. G. Millman; treasurer, H. Setterington; O. S. Griswold, director.

MINNESOTA.

WINDOM—The stockholders of the Windom Mutual Telephone Company have elected the following directors for the ensuing year: H. E. Hanson, J. J. Rupp, Henry Sherman, W. J. Clark, D. U. Weld, E. D. Mooers, O. C. Anderson.

WINDOM—The Mutual Telephone Company has elected the following officers: President, H. E. Hanson; vice-president, D. U. Weld; secretary, J. J. Rupp; treasurer, Henry Sherman.

MISSOURI.

GILLIAM—The Gilliam Telephone Company has elected the following officers and directors for the ensuing year: President, John W. McKinney; vice-president, R. N. Ayers; treasurer, W. T. Swinney; secretary and manager, W. R. Burton; directors, John W. McKinney, W. R. Burton, W. T. Swinney, R. N. Ayers, C. H. O. Leimbrock.

HANNIBAL—The stockholders of the Bluff City Telephone Company have elected the following officers and directors: President, J. F. Davidson; vice-president, T. G. Dulany; secretary and general manager, H. C. Conger; treasurer, J. P. Hinton; George W. Whitecotton, J. P. Hinton, J. F. Davidson, T. G. Dulany, W. C. Kettering, M. G. Conger and W. C. Keeler.

NEBRASKA.

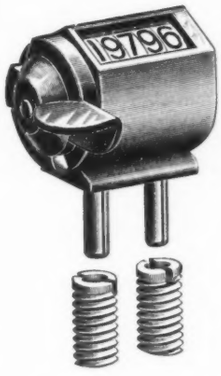
STANLEY—The Seneca-Gorham Telephone Company has elected the following officers: President, John A. Driscoll, Rochester; vice-president, Dr. D. S. Allen of Halls; secretary and treasurer, Rice Macauley of Stanley; auditor, Dr. D. A. Allen of Gorham.

WASHINGTON.

SILVER CREEK—The Home Telephone Company has elected the following directors for the ensuing six months: V. E. Barnett, F. E. Nederlander, L. W. Huntting, G. H. Tucker, Dr. Wm. Botzer, E. T. Huntting; president, V. E. Barnett; vice-president, F. E. Nederlander; secretary and manager, L. W. Huntting; superintendent of construction, Jacob J. Finstad.

VEEDER SWITCHBOARD COUNTERS

(STYLE 8)



Show rate of increase, so that exact calculations for the future may be made.

They likewise show how better to divide the work on the board among the operators.

Number of calls during each hour of the day can be shown. Interesting statistics are easily obtained by their use. Sockets fit in keyboard permanently. Counter can be inserted or removed at will.

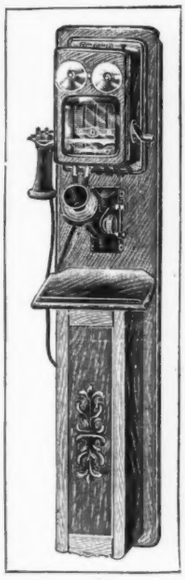
Free Booklet describing 10 styles of Counters.

THE VEEDER MFG. CO.

No. 1 Sargeant St., HARTFORD, CONN.

Cyclometers, Odometers, Tachometers, Counters, and Fine Castings.

REVERSED "SOLID BACK" TRANSMITTER



GREATEST VOLUME CLEARNESS, QUALITY

CENTRAL ENERGY and MAGNETO TELEPHONES

YOU CAN TALK BETTER by using our new Reversed "Solid Back" Transmitter. Its perfect tone and great intensity can only be appreciated by a trial.

YOU CAN HEAR BETTER with our Long Distance "Loud Speaking" Receiver with no exposed metal parts and permanent adjustment.

YOU CAN RING BETTER with our "Sampson" generator having imported steel magnets and Laminated Armature.

SEE OUR EXHIBIT, DECEMBER 13-14-15 ROOM 626, AUDITORIUM HOTEL, CHICAGO

The GEMMILL TELEPHONE & MFG. CO.

ORRVILLE, : : OHIO, U. S. A.

CABLE TERMINALS FOR CABLE CONSTRUCTION.

25 Pair Type B.

Hall Cable Boxes

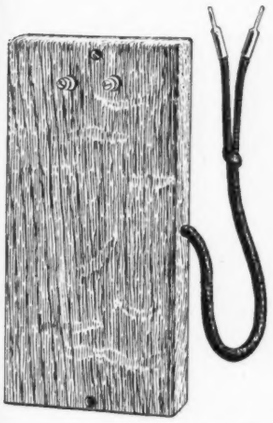
Neat, Substantial, Convenient, Designed for Underground and Aerial Installations, in all sizes; each pair provided with lightning protection.

Manufactured by

THE MOUNTAIN STATE ELECTRIC CO.

Correspondence Solicited. WHEELING, W. VA.

"Listening In"



Successful operation on Rural Telephone lines is greatly limited by the tendency of subscribers to leave the receiver off the hook or to "listening in."

ANDRAE

Telephone Condenser

enables "central" to ring up any party regardless of the position of the receivers on any other line. **Just what telephone companies need.** The Andrae Telephone Condenser saves time and trouble and unlike the many other devices on sale for this particular trouble, it allows the high frequency voice current to pass through readily but acts as an apparent high resistence to the low frequency currents. The simple construction of the Andrae Condenser obviates the necessity of an expert's service for its successful installation.

GUARANTEED.

Place 50 telephones on a line, remove 49 receivers and if you can ring through with receivers on you can ring through with receivers off. Write for our new No. 11 catalog.

Julius Andrae & Sons Co.

217 West Water St., Milwaukee, Wis.

WRITE TO ANDRAE

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WESTERN

CEDAR POLES

IDAHO WASHINGTON MONTANA

The Lindsley Brothers Co.

SPOKANE, WASHINGTON

NOTICE. Dealers advertise Western Poles who never saw one. We are located in the West, our money invested, ready at all times to give your orders our personal attention. We are producers—not scalpers—and acknowledged pioneers and original shippers of Western Cedar Poles. Write us.

GENERAL OFFICE CHICAGO TRIBUNE BUILDING

"FROM FOREST TO CONSUMER."

CEDAR POLES

The Humbird Lumber Co., Ltd.

SAND POINT, IDAHO.

All Sizes Large Stock Low Prices

Prompt Shipments

LONG POLES A SPECIALTY.

WRITE FOR PRICES.

T. M. Partridge Lumber Co.

PRODUCERS AND MERCHANTS

POLES

Large Stocks-----Quick Shipments-----Full Assortment

SPECIAL PRICES: 6" Poles, 20 ft. 6" Poles, 25 ft. 6" Poles, 30 ft. 7" Poles, 25 ft.

MINNEAPOLIS, - - MINNESOTA

ESTABLISHED IN 1867

WRIGHT BROS.

MARINETTE, WISCONSIN.

Wholesale and Retail Dealers in All Qualities and Kinds of

CEDAR

WE MAKE A SPECIALTY OF

POLES, POSTS AND TIES

WE WILL NOT BE UNDERSOLD

WRITE FOR DELIVERED PRICES

MAIN YARDS: Marinette, Wis., Amberg, Wis., Kelso, Mich., Lathrop, Mich., Beecher Lake, Wis., DeKuester's Sidings, Wis., [on Dunbar and Wausaukee R. R.,] ***Pembine, Wis.***

Address all inquiries to ***WRIGHT BROS., MARINETTE, WISCONSIN.***

Please tell the Advertiser you saw his Announcement in TELEPHONY.

CEDAR POLES

ALL SIZES FROM 16ft. to 70ft. for PROMPT SHIPMENT

We Own Large Tracts of Cedar Timber and Produce in Our Own Camps a Large Part of the Material we Handle.

WRITE FOR A COPY OF OUR TELEGRAPH CODE FOR CEDAR PRODUCTS.

C. H. WORCESTER CO.

Suite 1206, Tribune Building, Chicago, Ill., U. S. A.

CEDAR POLES

PRINCIPAL YARDS { CHICAGO, ILL. / MENOMINEE, MICH. / CHEBOYGAN, MICH. / WEST SUPERIOR, WIS.

E. E. NAUGLE TIE CO.

159 LA SALLE STREET

POLES—THE BEST
SHIPMENT—PROMPT
PRICES—FAIR

CHICAGO, ILL.

WRITE FOR PRICES

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SAND POINT CEDAR COMPANY
SAND POINT, IDAHO

Producers of

LONG IDAHO CEDAR POLES

OUR MOTTO:
GOOD MATERIAL, PROMPT SHIPMENT.

WRITE FOR PRICES

White Cedar Poles

ALL LENGTHS AND SIZES

We are especially anxious to sell
5 in. 25 ft., 5 in. 30 ft.,
6 in. 25 ft., 6 in. 30 ft.

HOLT LUMBER COMPANY

STOCKS AT
Oconto, Wis., C. & N.-W. and C. M. & St. P.
Mountain, Wis., C. & N.-W.
Pound, Wis., C. M. & St. P.
Riddle Jct., Mich., C. M. & St. P.

OCONTO, WIS.

Chicago Office, 315 Dearborn St.

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Hall L. Brooks Co.

Hayman Block, TOMAHAWK, WISCONSIN

DEALER IN

WHITE CEDAR POLES

POSTS AND PILING.

MIXED CAR LOTS A SPECIALTY

Write for Delivered Prices.

Pittsburg & Lake Superior Iron Co.,

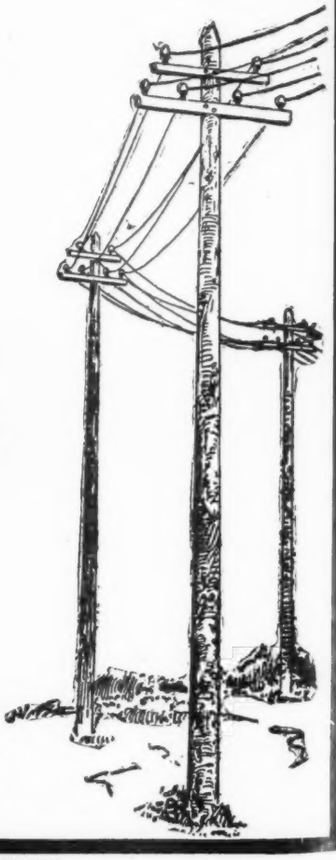
ESCANABA, MICHIGAN,

PRODUCERS AND WHOLESALERS

CEDAR POLES

FROM THE STUMP TO THE LINE.

WE ALWAYS CARRY A LARGE STOCK OF ALL SIZES OF WHITE CEDAR POLES, AND HAVING YARDS ON ALL PRINCIPAL RAILROADS IN NORTHERN MICHIGAN AND MINNESOTA, ARE IN POSITION TO MAKE IMMEDIATE SHIPMENT.



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BELTRAMI CEDAR & LAND CO.

JOHN R. STEWART, Gen. Manager.

BLACKDUCK, - - MINNESOTA.

We offer to the trade a complete stock of White Cedar Posts and Poles from 10 to 60 ft. long. We take special care to make this stock equal to the best. We manufacture white cedar shingles and this enables us to use for shingles logs which others would ship to avoid loss. We call particular attention to our selected poles 21 ft. long, just the poles for rural lines, the extra foot making them equal to 25 ft. They are no loss as they can be used for 7 and 14 ft.

We invite correspondence and assure our old customers they will receive the same careful consideration as in the past, and to new trade we ask to ship you one car for your careful inspection and opinion.

We want to move 21 and 25 ft. Poles.

SPECIALTIES.

21 ft. Poles 4 to 6 inch.
Short Poles 4 to 6 in. 10 to 20 ft.
25 ft. Telephone Poles.
Junction Poles.
6 1-2 in. 7 ft. Posts.
7 1-2 in. 7 ft. Posts, 7 foot Posts.

The best assorted stock. The Straightest. Prompt Shipments. Mixed Car Lots.

PENDLETON & GILKEY

816-817 Lumber Exchange Bldg.,
MINNEAPOLIS, MINN.

PRODUCERS OF EVERYTHING IN CEDAR.

CEDAR POLES

All Sizes Large Stock Low Prices
Prompt Shipments

YARDS

MOUNTAIN, WIS, ANDERSON, WIS. BREED, WIS.
JANESVILLE, WIS. SURING, WIS. LAKEWOOD, WIS.

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KELLOGG SWITCHBOARD AND SUPPLY CO.

CHICAGO, ILL.

WHOLESALERS OF

MICHIGAN WHITE CEDAR

POLES

OF QUALITY

Five Yards Prompt Shipments

CEDAR POLES

Large Stock; Best Quality; Prices Right
Write us before purchasing elsewhere

WITTENBERG CEDAR CO.

WITTENBERG, WISCONSIN

BARRY & BENTON

PRODUCERS AND WHOLESALERS OF

Idaho Cedar Poles

1300-2-4 OLD COLONY BUILDING, CHICAGO.

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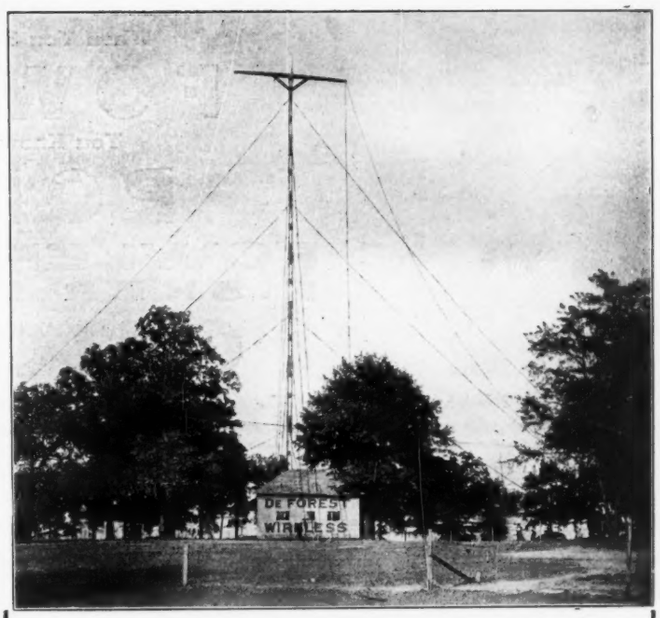

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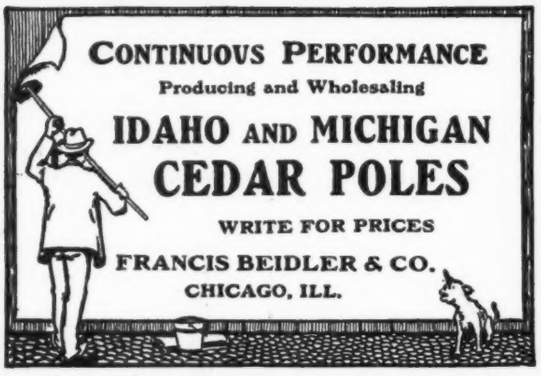

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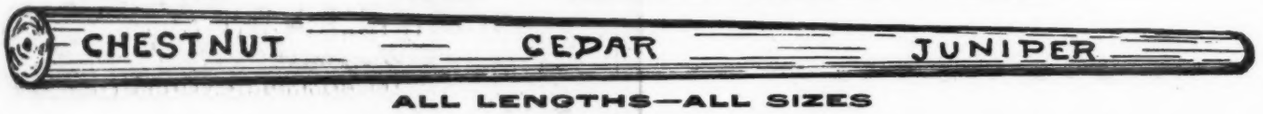

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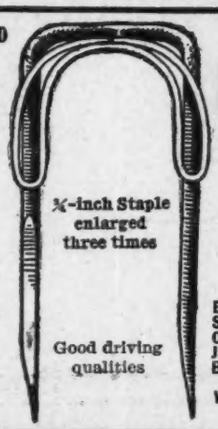

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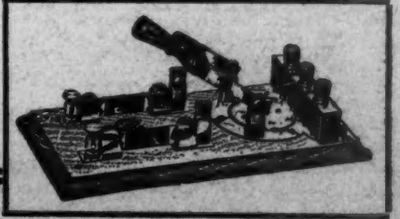

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